THE EIGHTH ANNUAL REPORT

OF THE

COMMISSIONER OF HEALTH

FOR THE

COMMONWEALTH OF PENNSYLVANIA

1913

PART II

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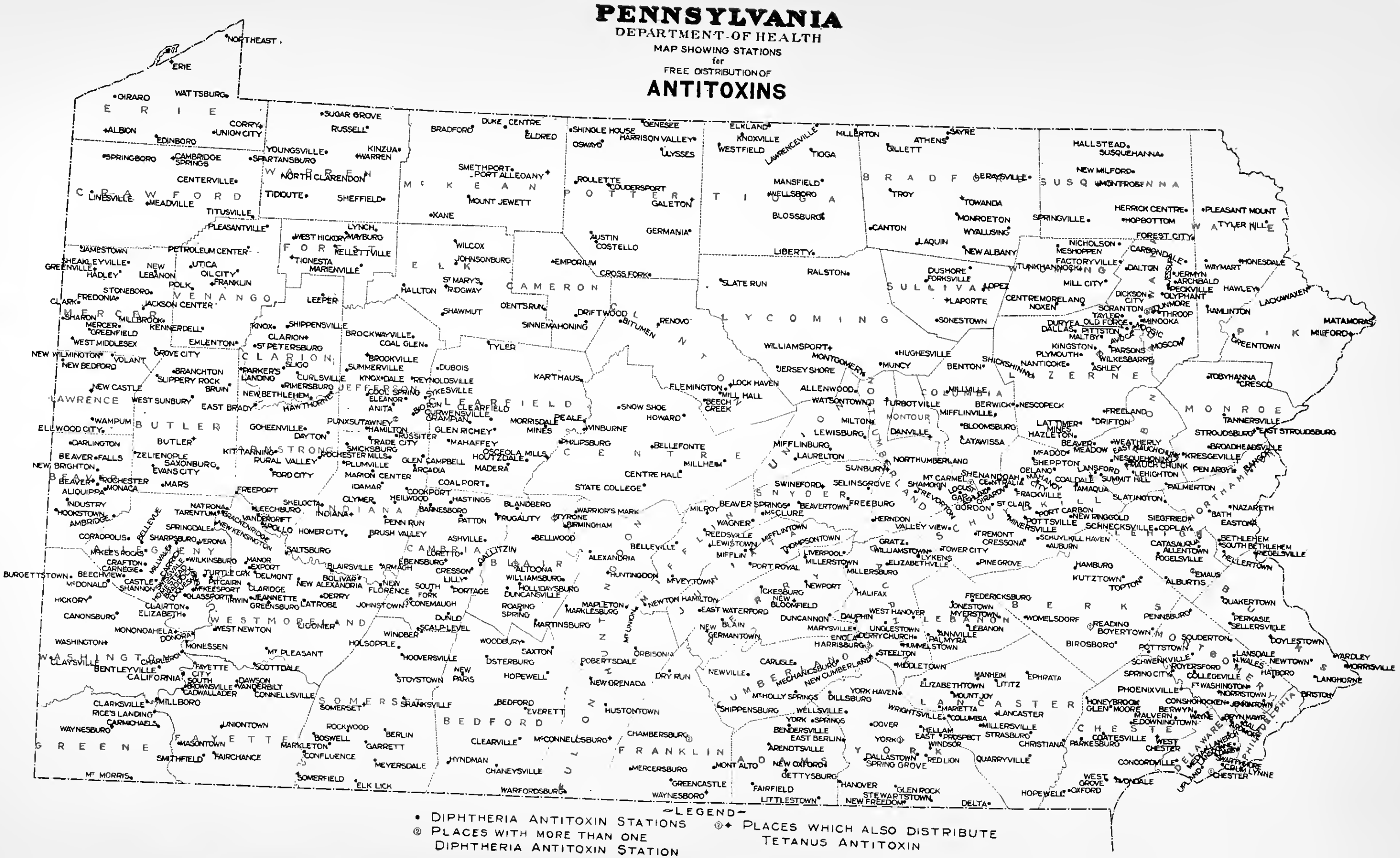
THE DIVISION OF DISTRIBUTION OF BIOLOGICAL PRODUCTS.

HENRY W. PEIRSON, *Chief.*


PENNSYLVANIA
DEPARTMENT OF HEALTH
MAP SHOWING STATIONS
for
FREE DISTRIBUTION OF
ANTITOXINS
ERIE
CRAWFORD
WARREN
McKEAN
POTTER
TIOGA
BRADFORD
SUSQUEHANNA
WAYNE
PIKE
FOREST
ELK
CAMERON
LYCOMING
SULLIVAN
WYOMING
LACKAWANNA
LUZERNE
MONROE
MERCER
VENANGO
CLARION
JEFFERSON
CLEARFIELD
CENTRE
CLINTON
UNION
SNYDER
NORTHUMBERLAND
MONTOUR
COLUMBIA
CARBON
NORTHAMPTON
LEHIGH
SCHUYLKILL
LAWRENCE
BUTLER
ARMSTRONG
INDIANA
CAMBRIA
BLAIR
HUNTINGDON
MIFFLIN
JUNIATA
PERRY
DAUPHIN
LEBANON
BERKS
BUCKS
MONTGOMERY
BEAVER
ALLEGHENY
WESTMORELAND
SOMERSET
BEDFORD
FULTON
FRANKLIN
CUMBERLAND
ADAMS
YORK
LANCASTER
CHESTER
DELAWARE
PHILADELPHIA
WASHINGTON
GREENE
FAYETTE
—LEGEND—
• DIPHTHERIA ANTITOXIN STATIONS
② PLACES WITH MORE THAN ONE DIPHTHERIA ANTITOXIN STATION
③ ✦ PLACES WHICH ALSO DISTRIBUTE TETANUS ANTITOXIN

THE DIVISION OF DISTRIBUTION OF BIOLOGICAL PRODUCTS.

The Division of Distribution of Biological Products, Department of Health of the State of Pennsylvania, during the year 1913 distributed free to the indigent of the State four distinct products, as follows:—

First. Diphtheria Antitoxin, now furnished through 667 Distributors, nearly all druggists, located at convenient points in each county throughout the entire State except in the cities of Philadelphia and Pittsburgh. This distribution began November 4th, 1905, when 473 Distributors were appointed. The locations of these distributing points may be ascertained from the map on the opposite page.

Second. Tetanus Antitoxin, now furnished to the poor of the State through sixty-eight distributors at different points in nearly every county, but not in the cities of Philadelphia and Pittsburg. The distribution of this product was begun in 1910 in anticipation of the dangers of the approaching Fourth of July. In 1913, as also in 1912 and 1911, the Distributors were again similarly prepared to meet the dangers of exuberant patriotism, and arrangements were continued to make the Antitoxin easily attainable for those who might be injured at other times. In this connection it may be well to state that the reason for the small number of Tetanus Antitoxin distributing stations as compared with the number of Diphtheria Antitoxin stations is because Tetanus Antitoxin if given within forty-eight hours after injury, is effective, and the Tetanus Stations are so located that from nearly every locality in the State, one or more stations may be reached within twenty-four hours.

Third. Tubercle Bacilli Products so called, namely, Tubercle Bacilli Extract and Suspension of Dead Tubercle Bacilli. The distribution of these products began June 29th, 1909, when only the Dilutions from No. 1 to No. 10 of both Extract and Suspension were available. The Extract is now put up in Dilutions from No. 1 to No. 20, and the Suspension in Dilutions from No. 1 to No. 16, as defined on page 742, below. They are furnished by the Department upon requisition of the Physicians in charge of the Tuberculosis Dispensaries and have been used quite extensively during the past year in the treatment of patients at the Pennsylvania State Sanatoria for tuberculosis at Mont Alto and Cresson. The Department of Health undertook the preparation of these products in its own laboratories in

June, 1912, and for the remainder of that year this was the source of supply, except for a few syringes occasionally furnished by H. M. Alexander & Co. During 1913 the laboratories have supplied all the tubercle bacilli products used.

Fourth. Vaccine and Vaccine supplies, transferred from the General Office to this Division, January 27th, 1909. They are now furnished upon requisitions of the County Medical Inspectors of the Department of Health for the poor of townships not of the first class, to the various tuberculosis dispensaries of the Department, to poor charitable institutions when asked for during a local or general epidemic of smallpox, and as may be otherwise ordered by the Commissioner of Health.

DIPHTHERIA ANTITOXIN.

METHOD OF DISTRIBUTION.

Antitoxin in curative and immunizing doses may be secured by physicians practising in this Commonwealth upon their declaring in writing that no charge of any kind is to be made for the Antitoxin, and that the person or persons for whom it is obtained are indigent in the sense that they cannot procure the necessities of life and at the same time purchase antitoxin, and also that the physician will send to the Department of Health a full clinical report as specified by the Commissioner of Health.

After appointment the Distributor is furnished with an initial supply of serum, consisting of five packages of 1,000 units and five packages of 5,000 units, together with the blank forms, stamped envelopes, etc., necessary for its distribution.

In token of his authority to act in behalf of the Department of Health, each Distributor of Diphtheria Antitoxin receives upon appointment a Commission in the following form:—

COMMISSION.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
Division of Distribution of Biological Products.

Know all men by these presents, that.....
residing at.....in the county of.....
State of Pennsylvania, ha..., this.....day of.....
been duly appointed Distributor of Diphtheria Antitoxin, at.....
.....County, Pennsylvania, under the rules of the Department of Health.

(SEAL.)

.....
Commissioner of Health.

Detailed information regarding distribution may be found in the letter of instructions, Form B. P. 516, below, and in the various forms which follow.

Form B. P. 516.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.
DIVISION OF DISTRIBUTION OF BIOLOGICAL PRODUCTS.

INSTRUCTIONS TO DISTRIBUTORS REGARDING THE DISTRIBUTION AND USE OF DIPHTHERIA ANTITOXIN.

In the distribution of Diphtheria Antitoxin there are THREE printed forms which MUST be filled out.

FIRST IN IMPORTANCE, FORM B. P. 517, is known as the Application and Receipt. It is in a small book containing 100 numbered pages—50 white and 50 blue—the white to be signed by the physician and forwarded to the Department after the amounts of Antitoxin secured by him are properly filled out in the spaces reserved for this purpose; the blue, on which the carbon copy is taken, remains in the book for the Distributor's own record. A space is specifically provided in the lower left hand corner of this FORM B. P. 517 for a statement of Distributors' stock of Antitoxin on hand, the filling out of which space will prevent the distributor from ever allowing his stock of Antitoxin to become ENTIRELY exhausted, as a careful examination is made of each FORM B. P. 517 immediately upon its receipt and if stock is found to be low, additional supply is at once forwarded. This avoids the expense of telegraph and telephone messages to the Department for additional stock.

A physician having a case of Diphtheria among the poor should immediately APPLY to the nearest Distributor, SIGN a RECEIPT, Form B. P. 517, and secure all the Antitoxin he needs for the treatment of the case. He agrees, as you will see by the Application and Receipt, to return to the Distributor all unused Antitoxin WITHIN TEN DAYS after securing same.

Our experience teaches us that the Distributor should require physicians to sign for the Antitoxin BEFORE securing same, if at all possible, because when they send for it they often fail to come in and receipt for same for several days and sometimes never sign for it at all.

SECOND, FORM B. P. 519—is the little slip found wrapped around the outside of the box of Antitoxin. It is to be filled out by the physician, with the patient's name and address, date of use, physician's signature and address, distributor's name and address, and MUST when returned to the Distributor be forwarded by him to the Department of Health together with the above mentioned Application and Receipt, Form B. P. 517, in the printed stamped envelopes furnished to the Distributor.

THIRD, FORM B. P. 518—is the Clinical Report and is found inside the box of Antitoxin. The Physician fills this out, signs and returns it to the Department at the termination of the case. The Distributor has NOTHING WHATEVER TO DO WITH THIS FORM.

SPECIAL NOTICE:—INSTRUCTIONS relative to sale of Antitoxin belonging to the State supply ONLY in case of emergency. It sometimes happens the private supply of the Distributor becomes exhausted at a time when a call may come from a person well able to pay for same. In such cases the Distributor is allowed to take Antitoxin from his State supply with the distinct understanding that it

MUST BE IMMEDIATELY REPLACED BY PURCHASE from Messrs. H. M. Alexander & Co., at their market price, and in communicating with them in regard thereto the Distributor should not fail to make clear the exact number of either 1000, or 5000 unit packages of STATE goods being replaced. In this connection I would state that the same record is required by the Department for goods that are sold and taken from the State supply as is made for indigent cases, the only difference being that the word "SOLD" must be written across the face of all these records for identification here.

Our distributing agents, Messrs. H. M. Alexander & Co., Marietta, Pa., have been instructed to forward you an INITIAL supply of five packages of 1000 units and five packages of 5000 units of Antitoxin, and Distributors should bear in mind that an additional supply will be furnished immediately upon notification that this stock is NEARLY exhausted, which notice can be made by simply filling up the space in the lower left hand corner of FORM B. P. 517 specially provided for a statement of stock on hand.

Should an epidemic of Diphtheria break out in your locality, when a large quantity of Antitoxin might be needed at once, you are authorized to telegraph, C. O. D., (Using the enclosed code) or to telephone, reversing charges to this office for the necessary additional supply.

SAMUEL G. DIXON, M. D.,
Commissioner of Health.

Form B. P. 517.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.

APPLICATION AND RECEIPT FOR DIPHTHERIA ANTITOXIN.

.....19....

I hereby acknowledge the receipt of the following named amounts of Diphtheria Antitoxin, for use in the family of.....
.....packages containing 1,000 units, Laboratory Nos.,.....
.....packages containing 3,000 units. Laboratory Nos.,.....
.....packages containing 5,000 units. Laboratory Nos.,.....
from.....Distributor, Address, ...
in the name of the Department of Health. I hereby certify that the persons mentioned for whom this Antitoxin is furnished for the treatment of diphtheria are indigent in the sense that they cannot procure the necessities of life and at the same time purchase Antitoxin. I agree to make no charge for it directly or indirectly, and if unused, to return to the Distributor within ten days; also to mail to the Department of Health, immediately upon termination, a clinical report for each case, on the blanks furnished for this purpose.

We have in stock at this time:
.....packages of 1,000 units.
.....packages of 3,000 units.
.....packages of 5,000 units.

.....
(Physician's Signature.)
.....
(Address.)

.....
(Distributor's Signature.)

.....
(Full Address.)

In signing this receipt the physician, by means of the inlaid carbon paper, also signs the blue stub bearing the same number. The blue stub is for the Distributor's personal record of Antitoxin issued by him and the Form B. P. 517 printed upon it is identical with that on the white slip. The white slip is forwarded to the Department by the Distributor with Form B. P. 519 given below.

Each package of this Antitoxin has wrapped about it a narrow slip of paper on which is printed a form useful for identification, as follows:—

Form B. P. 519.

Diphtheria Antitoxin.	COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF HEALTH.
..... Units	Diphtheria Antitoxin, ...Units
Manufacturer.	Manufacturer, ...Laboratory No. ....
.....	Patient, ...Address .....
Laboratory No.	Date of use, ...
Date within which the unopened vial or attached slip must be returned to	Physician's signature, ...
Distributor	Address, ...
.....	Distributor's signature, ...
	Address, ...
	This slip when returned to Distributor must be forwarded to the Department of Health, together with the application for the same.
	SAMUEL G. DIXON, Commissioner.

Form B. P. 518.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.

CLINICAL REPORT OF DIPHTHERIA TREATED WITH ANTITOXIN.

Use a separate blank for each case and forward immediately upon termination of the same to the Department of Health, Harrisburg, Pa.

Patient's name, ... Address, ... County, ... Pa.

Age, ... Sex, ... Color, ... Date of first visit, ...

Month Day. Year.

Was treatment immunizing or curative? .....

If the treatment was immunizing, answer only the following questions:

Date of treatment, ... No. of units used, ...

How long had patient been exposed to the disease? .....

Did patient subsequently contract the disease? (Yes or No.)?.....

If the treatment was curative, answer the following questions:

Date of onset of the disease, ...

Month Day Year.

SPECIFY EACH TREATMENT.

.....units used within.....hours of onset.
.....units used within.....hours after first treatment.
.....units used within.....hours after second treatment.
.....units used within.....hours after third treatment.
.....units used within.....hours after fourth treatment.
.....units used within.....hours after fifth treatment.
.....units used within.....hours after sixth treatment.
.....units used within.....hours after seventh treatment.
.....units used within.....hours after eighth treatment.
.....units used within .....hours after ninth treatment.

State whether disease was Post-nasal, Tonsillar, Pharyngeal, Laryngeal.
(Specify by *crossing out* names of *regions unaffected.*)

State complications, if any, ...
State termination (Recovery or Death), ...
Number of persons in household, ... Number affected, ...Number immunized, ...
What was the probable source of infection? .....
Remarks, ...
.....
Distributor's Name, ...Signature, ...M. D.
Address, ...Address .....

These three Forms, B. P. 517, 518 and 519, when properly filled out, make a complete record of each case of distribution and use of Diphtheria Antitoxin issued by the Department of Health.

DIPHTHERIA ANTITOXIN—1905-1913.

The establishment of stations for the distribution of Diphtheria Antitoxin among the indigent in the State of Pennsylvania and the naming of Distributors began November 4th, 1905, when 473 Distributors, mostly duly registered druggists, were appointed at convenient places. Some Antitoxin was distributed, however, in October, 1905, before any distributors were appointed. In 1906, this number was increased to 511; in 1907, to 529; in 1908, to 569; in 1909, to 650; in 1910, to 656; in 1911, to 662; and in 1912, to 667. No additions were made to these in 1913.

From the date of the very beginning of the distribution of Diphtheria Antitoxin to the indigent throughout the State of Pennsylvania by the Department of Health, in October, 1905, up to and including December 31st, 1913, fifty-five thousand four hundred and seventy (55,470) cases of diphtheria were treated for cure, four thousand five hundred and forty-three (4,543) of which, or 8.19% resulted fatally.

The following statement shows the total number treated, the number cured, the number of deaths and the percentage of deaths for each year, from 1905 to 1913, inclusive.

STATEMENT SHOWING RESULTS OF CURATIVE TREATMENT OF DIPHTHERIA BY ANTITOXIN—1905-1913.

Years.	Total Treated.	Number Cured.	Number Deaths.	Percentage of Deaths.
1905,	293	255	38	12.97
1906,	3,529	3,136	393	11.14
1907,	5,271	4,895	376	7.13
1908,	6,336	5,794	542	8.55
1909,	5,365	4,949	416	7.75
1910,	6,524	5,965	559	8.57
1911,	7,793	7,283	510	6.54
1912,	9,919	9,156	763	7.69
1913,	10,440	9,494	946	9.06
Totals,	55,470	50,927	4,543	8.19

In addition to the number mentioned above that were treated for cure, forty-five thousand five hundred and fifty-six (45,556) persons, mostly little children, who were exposed to the disease were immunized, and of this number so immunized, only seven hundred and one (701) contracted the disease.

The following statement will show the total number immunized, the number not developing and the number developing diphtheria for each year from 1905 to 1913, inclusive.

STATEMENT SHOWING RESULTS OF TREATMENT WITH DIPHTHERIA ANTITOXIN FOR IMMUNIZATION—1905-1913.

Years.	Number Treated.	Number Not developing.	Number Developing.
1905,	155	150	5
1906,	2,334	2,257	77
1907,	3,799	3,765	34
1908,	3,965	3,920	45
1909,	4,847	4,738	109
1910,	5,194	5,107	87
1911,	6,906	6,781	125
1912,	8,581	8,487	94
1913,	9,775	9,650	125
Totals,	45,556	44,855	701

The total number of packages of Diphtheria Antitoxin *supplied* to Distributors up to and including December 31st, 1913, was seventy-two thousand four hundred and fifty-six (72,456) of one thousand (1,000) units; seventy-three thousand three hundred and eighty-two (73,382) of three thousand (3,000) units and forty-eight thousand three hundred and seventy-three (48,373) of five thousand (5,000) units; while the total number of packages actually *used* was fifty-one thousand seven hundred and thirteen (51,713) of one thousand (1,000) units; sixty-one thousand and seventy-two (61,072) of three thousand (3,000) units; and forty thousand and seventy-five (40,075) of five thousand (5,000) units; making a grand total of one hundred ninety-four thousand two hundred and eleven (194,211) packages of Diphtheria Antitoxin *supplied* to Distributors and of one hundred fifty-two thousand eight hundred and sixty (152,860) packages actually *used;* the difference, or forty-one thousand three hundred and fifty-one (41,351) packages of 1,000, 3,000 and 5,000 units of Antitoxin, being the stock in the hands of the 667 Distributors throughout the State.

The entire cost of the one hundred and ninety-four thousand two hundred and eleven (194,211) packages of Antitoxin so supplied for the eight years and three months, was $201,222.40, as in the following statement by years:

Years.	No. of Packages.	Units	Cost.
1905,	5,967	1,000 & 3,000,	$7,251 80
1906,	12,108	1,000 & 3,000,	16,192 32
1907,	14,154	1,000 & 3,000,	17,387 13
1908,	18,210	1,000, 3,000 & 5,000,	14,056 40
1909,	22,318	1,000, 3,000 & 5,000,	16,565 52
1910,	24,264	1,000, 3,000 & 5,000,	22,232 18
1911,	30,158	1,000, 3,000 & 5,000,	27,983 01
1912,	31,667	1,000, 3,000 & 5,000,	35,723 76
1913,	35,365	1,000, 3,000 & 5,000,	43,830 28
	194,211		$201,222 40

Therefore, the total number of persons who were actually treated for cure together with those immunized, with the one hundred and ninety-four thousand two hundred and eleven (194,211) packages of Diphtheria Antitoxin distributed by the Department of Health in eight years and three months was one hundred and one thousand and twenty-six (101,026) mostly little children; and the total cost for the Antitoxin used in treating these cases was $201,222.40, or a per capita cost of $1.99, surely a moderate sum for the results obtained.

The following statement giving the number of syringes of Diphtheria Antitoxin *supplied* to Distributors during the last three months of 1905, and during each month of the years 1906 to 1913, shows a steadily increasing demand for the use of this life saving agent for the treatment of diphtheria among the poor:—

NUMBER OF SYRINGES OF ANTITOXIN SUPPLIED TO DISTRIBUTORS BY MONTHS FROM OCTOBER 1, 1905, TO DECEMBER 31, 1913.

Years.	Units.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1905,	1,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	64	2,517	377	2,958
	3,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	59	2,488	462	3,009
1906,	1,000	314	256	289	285	148	118	156	1,143	561	1,016	824	527	4,738
	3,000	503	391	455	476	295	243	314	336	768	1,408	1,274	1,007	7,470
1907,	1,000	400	269	327	316	282	221	363	526	317	648	670	804	5,173
	3,000	809	547	618	611	468	433	535	824	702	784	1,267	1,293	8,981
1908,	1,000	467	401	380	593	437	515	418	590	484	917	725	826	6,791
	3,000	807	861	734	752	541	811	605	614	920	1,504	1,534	1,619	11,302
	5,000	.....	.....	.....	.....	.....	.....	.....	50	5	20	20	20	115
1909,	1,000	586	979	681	517	717	766	376	372	446	1,189	1,228	822	8,680
	3,000	1,171	887	1,127	770	972	821	865	817	844	1,774	1,712	1,461	13,221
	5,000	18	28	13	15	0	38	8	18	13	78	115	73	417
1910,	1,000	524	632	906	153	789	270	370	586	743	1,079	1,067	1,489	8,603
	3,000	1,275	1,127	985	877	1,028	682	616	816	993	1,455	1,412	1,150	12,416
	5,000	50	79	77	67	193	179	146	397	396	516	503	547	3,240
1911,	1,000	804	967	602	433	597	518	395	702	1,389	1,783	1,629	1,173	11,292
	3,000	1,016	895	938	718	741	676	625	840	1,191	1,916	1,506	1,139	12,214
	5,000	526	314	382	279	348	327	253	302	594	1,232	1,142	903	6,672
1912,	1,000	1,157	631	626	585	491	394	459	715	1,000	2,132	2,001	1,741	11,775
	3,000	1,217	596	804	460	538	490	527	97	0	11	4	16	1,760
	5,000	910	580	432	437	382	378	460	959	1,802	3,379	2,845	2,588	15,132
1913,	1,000	1,284	981	739	920	778	886	392	1,052	1,192	1,483	1,380	1,452	12,309
	2,000	1	.....	.....	.....	.....	.....	.....	3	.....	2	3	.....	9
	5,000	2,222	1,799	1,513	1,598	1,554	1,282	1,117	1,517	2,418	2,531	2,352	2,911	22,817

SUMMARY OF SYRINGES SUPPLIED.

	1,000 Units.	3,000 Units.	5,000 Units.
1905,	2,958	3,009	0
1906,	4,638	7,470	0
1907,	5,173	8,981	0
1908,	6,793	11,302	115
1909,	8,689	13,221	417
1910,	8,608	12,416	3,240
1911,	11,292	12,214	6,652
1912,	11,775	4,760	15,132
1913,	12,539	9	22,817
	72,456	73,382	48,373

The following statement giving the number of syringes of Diphtheria Antitoxin actually *dispensed* by Distributors during the three months of 1905 and during each month of the years 1906 to 1913, also shows a steadily increasing use of Diphtheria Antitoxin for the treatment of Diphtheria among the poor.

NUMBER OF SYRINGES OF ANTITOXIN DISPENSED BY DISTRIBUTORS BY MONTHS FROM DECEMBER 1, 1905, TO DECEMBER 31, 1913.

Years.	Units.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
1905,	1,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	327	327
	3,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	619	619
1906,	1,000	210	225	231	190	157	117	106	174	434	701	681	499	3,725
	3,000	474	372	404	337	291	233	221	320	657	1,129	1,135	991	6,564
1907,	1,000	328	301	277	264	230	190	207	429	327	502	527	572	4,214
	3,000	758	572	625	522	497	363	491	620	671	1,058	1,111	1,021	8,309
1908,	1,000	427	403	189	127	257	192	230	213	497	603	579	609	4,326
	3,000	806	822	439	369	527	488	314	367	847	1,234	1,346	1,251	8,810
	5,000	.....	.....	.....	.....	.....	.....	.....	.....	18	14	17	12	61
1909,	1,000	501	681	360	396	325	188	326	280	371	1,178	628	724	5,958
	3,000	1,051	860	793	576	682	532	661	667	858	1,641	1,329	1,443	11,993
	5,000	4	16	15	21	1	14	7	14	28	99	55	80	334
1910,	1,000	518	458	421	421	309	297	308	382	631	838	881	773	6,337
	3,000	984	994	873	856	686	632	588	689	842	1,126	1,278	963	10,511
	5,000	62	47	72	72	46	149	142	295	376	502	546	491	2,890
1911,	1,000	624	514	641	456	365	380	323	489	904	1,376	1,164	953	8,389
	3,000	805	738	846	552	501	514	540	606	1,041	1,396	1,428	980	10,000
	5,000	497	324	399	294	259	292	241	311	524	1,039	987	909	6,076
1912,	1,000	629	562	558	447	383	305	440	492	903	1,466	1,480	1,027	8,692
	3,000	768	554	639	458	392	402	385	418	338	254	254	168	4,881
	5,000	524	545	529	479	390	325	351	583	1,253	2,409	2,162	1,796	11,339
1913,	1,000	1,079	827	667	671	660	584	538	656	999	1,131	1,185	1,037	10,654
	3,000	119	52	18	25	16	10	16	5	3	1	5	2	252
	5,000	1,886	1,524	1,428	1,367	1,322	1,110	1,092	1,341	1,858	2,202	2,222	2,133	19,705

SUMMARY OF SYRINGES DISTRIBUTED.

	1,000 Units.	3,000 Units.	5,000 Units.	Number of distributors.
1905,	327	619	0	473
1906,	3,725	6,564	0	511
1907,	4,214	8,309	0	529
1908,	4,326	8,840	61	569
1909,	5,958	11,086	234	650
1910,	6,237	10,501	2,800	656
1911,	8,180	10,000	6,076	662
1912,	8,692	4,881	11,339	667
1913,	10,054	272	19,515	667
	51,713	61,072	40,075	.....

STATEMENT.

SHOWING THE RESULTS OF TREATMENT OF DIPHTHERIA WITH ANTITOXIN ACCORDING TO PERIOD OF INITIAL TREATMENT AFTER ONSET, FOR THE YEARS 1905-1913.

		First day.	Second day.	Third day.	Fourth day.	Fifth day.	Sixth day & later.	Total.
1905,	Cases treated, ...	186	56	26	13	4	8	293
	Deaths, ...	18	9	3	3	2	3	38
	Percentage, ...	9.68	16.07	11.54	23.08	50.00	37.50	12.97
1906,	Cases treated, ...	2,105	902	302	107	52	61	3,529
	Deaths, ...	185	84	66	24	15	19	393
	Percentage, ...	8.79	9.31	21.85	22.43	28.85	31.15	11.14
1907,	Cases treated, ...	3,463	1,139	403	136	63	67	5,271
	Deaths, ...	159	100	55	32	11	19	376
	Percentage, ...	4.59	8.78	13.65	23.53	17.46	28.36	7.13
1908,	Cases treated, ...	3,979	1,464	540	162	103	88	6,336
	Deaths, ...	260	116	78	37	29	22	542
	Percentage, ...	6.53	7.92	14.44	22.83	28.15	25.00	8.55
1909,	Cases treated, ...	3,239	1,266	456	186	77	81	5,365
	Deaths, ...	124	128	75	38	24	27	416
	Percentage, ...	3.76	10.11	16.45	20.43	31.17	33.33	7.75
1910,	Cases treated, ...	4,155	1,437	560	196	84	92	6,524
	Deaths, ...	238	131	94	44	23	29	559
	Percentage, ...	5.73	9.12	16.78	22.45	27.38	31.52	8.57
1911,	Cases treated, ...	4,847	1,789	665	238	119	135	7,793
	Deaths, ...	151	145	93	62	26	33	510
	Percentage, ...	3.11	8.11	13.98	26.05	21.84	24.44	6.54
1912,	Cases treated, ...	6,246	2,238	828	299	139	169	9,919
	Deaths, ...	331	188	101	61	30	52	763
	Percentage, ...	5.30	8.40	12.20	20.40	21.58	30.77	7.69
1913,	Cases treated, ...	6,572	2,336	924	310	142	156	10,440
	Deaths, ...	444	222	139	54	35	52	946
	Percentage, ...	6.76	9.50	15.04	17.42	24.65	33.33	9.06
Grand totals, .	Cases treated, ...	34,852	12,627	4,704	1,647	783	857	55,470
	Deaths, ...	1,910	1,123	704	355	195	256	4,543
	Percentage, ...	5.48	8.89	14.97	21.56	24.90	29.87	8.19

SUMMARY OF THE RESULTS OBTAINED BY THE PENNSYLVANIA DEPARTMENT OF HEALTH WITH THE USE OF DIPHTHERIA ANTITOXIN.

1905.

Number of cases cured during October, November and December, 1905,	255
Number of deaths,	38
Total number treated,	293
Percentage of deaths,	12.97
Number immunized,	155
Number immunized and later contracting the disease,	5
Total cost (Including "Initial Supply" costing $6,199.73),	$7,251 80

1906.

Number of cases cured during January 1st to December 31st, 1906,	3,136
Number of deaths,	393
Total number treated,	3,529
Percentage of deaths,	11.14
Number immunized,	2,334
Number immunized and later contracting the disease,	77
Total cost,	$16,192 32

1907.

Number of cases cured from January 1st to December 31st, 1907,	4,895
Number of deaths,	376
Total number treated,	5,271
Percentage of deaths,	7.13
Number immunized,	3,799
Number immunized and later contracting the disease,	34
Total cost,	$17,387 13

1908.

Number of cases cured from January 1st to December 31st, 1908,	5,794
Number of deaths,	542
Total number treated,	6,336
Percentage of deaths,	8.55
Number immunized,	3,965
Number immunized and later contracting the disease,	45
Total cost,	$14,056 40

1909.

Number of cases cured from January 1st to December 31st, 1909,	4,949
Number of deaths,	416
Total number treated,	5,365
Percentage of deaths,	7.75
Number immunized,	4,847
Number immunized and later contracting the disease,	109
Total cost,	$16,565 52

1910.

Number of cases cured from January 1st to December 31st, 1910,	5,965
Number of deaths,	559
Total number treated,	6,524
Percentage of deaths,	8.57
Number immunized,	5,194
Number immunized and later contracting the disease,	87
Total cost,	$22,232 18

1911.

Number of cases cured from January 1st to December 31st, 1911,	7,283
Number of deaths,	510
Total number treated,	7,793
Percentage of deaths,	6.54
Number immunized,	6,906
Number immunized and later contracting the disease,	125
Total cost,	$27,983 01

1912.

Number of cases cured from January 1st to December 31st, 1912,	9,156
Number of deaths,	763
Total number treated,	9,919
Percentage of deaths,	7.69
Number immunized,	8,581
Number immunized and later contracting the disease,	94
Total cost,	$35,723 76

1913.

Number of cases cured from January 1st to December 31st, 1913,	9,494
Number of deaths,	946
Total number treated,	10,440
Percentage of deaths,	9.06
Number immunized,	9,775
Number immunized and later contracting the disease,	125
Total cost,	$43,830 28

GENERAL SUMMARY.

Number of cases cured from October, 1905, to December 31st, 1913,	50,927
Number of deaths,	4,543
Total number treated,	55,470
Percentage of deaths,	8.19
Number immunized,	45,556
Number immunized and later contracting the disease,	701
Total cost,	$201,222 40

SUMMARY OF OBSERVATIONS UPON THE USE OF THE DIPHTHERIA ANTITOXIN DISTRIBUTED BY THE STATE DEPARTMENT OF HEALTH IN PENNSYLVANIA FOR THE YEAR 1913.

CURATIVE TREATMENT.

On September 1, 1912, the Commissioner of Health, Dr. Samuel G. Dixon, substituted 5,000 unit doses of Diphtheria Antitoxin for 3,000 unit doses for initial use, it having been already shown that the larger dose had greatly reduced the death rate in 2,793 cases. With very few exceptions this was the initial dose during the year 1913.

A comparison of the figures for the year 1912 with those for 1913, in the preceding able will show that the number of persons treated, 10,440, in 1913, was greater than the number treated in 1912, by 521, and that the number of deaths, 946 in 1913, is disproportionately increased by 183. While this death rate—9.06%—is relatively low, it is somewhat higher than that for 1912—1.07% to be exact—and the increase is not readily to be explained unless variations in the virulence of infecting organisms or a probably greater incidence of

complications or mixed infections—notably scarlet fever—be taken into consideration. It is not confined to one or two of the periods after onset of the disease in which treatment was commenced, but appears in all except as relating to those cases treated on the fourth day, where it dropped 2.98%. When treatment was commenced on the first or second day the increase is slightly above 1%, while treatment on the third, fifth and sixth day or later resulted in a number of deaths approximately 3% greater than in corresponding periods of treatment in 1912. The number of cases treated on the first and second day of disease, is sufficiently large to give rather reliable data. In the later periods, it is considerably less, and accidental or atypical percentages are more likely to creep in. In both years, however, these totals correspond sufficiently well perhaps to admit of comparison.

The Tables I to V, inclusive, below, have been compiled from data furnished in the clinical reports of physicians using Antitoxin in cases among the indigent. They are largely self explanatory and call for little comment.

The first merely confirms the well known advantage of large doses of Antitoxin, administered early in the course of the disease; the second, the relative immunity of infants, with increasing susceptibility up to the ninth year, especially noticeable between the fifth and ninth, from which age it declines. The third table serves to illustrate the greater effectiveness of the natural defenses of the older individual following infection, if comparison be made of the fatal cases in these and the younger, when the administration of Antitoxin has been delayed. Thus at twenty years and upward when Antitoxin was given on the sixth day or later, the mortality may be computed as approximately 21%, while between five and nine years under the same circumstances it is somewhat above 40%, something over 30% being the average death rate in such patients under twenty years.

Table IV presents the relative fatality of diphtheria, according to the region or regions involved, the results of treatment of these various types of involvement with varying Antitoxin dosage, and incidentally the frequency of occurrence of these types. A glance at the totals shows the commonest form to be tonsillar, with a mortality of less than 2% irrespective of the amount of Antitoxin given, age or time of administration, while the pharyngeal-tonsillar type is next in frequency of occurrence, with a mortality scarcely above 3%. Post-nasal-pharyngeotonsillar-laryngeal involvement occurred relatively infrequently but was decidedly the most fatal. Laryngeal infection stands third in the order of frequency and with the pharyngeo-laryngeal type—occurring in much fewer instances however—gave an approximate mortality of 25%; wherein the obstructive

nature of the exudate must be largely concerned, as is well known. The addition of post-nasal involvement to one or more of the others had a tendency to increase the seriousness of the infection.

A comparison of mortality as relating to the severer types of involvement only, would show that large doses—10,000 units or more—gave better results by approximately 3% in laryngeal and general involvement, while in the pharyngeotonsillar-laryngeal cases doses of 10,000 units or less resulted in a death rate of 32.39%, and the larger doses in a death rate of 16.79%. In all of these too, the percentage of deaths where larger doses were used is less than the general death rate for the corresponding type of disease, regardless of the dose employed.

TABLE I.

Antitoxin Treatment of Diphtheria for 1913.
Initial Dose 5000 Units.
Relation of Initial Treatment to Time of Onset.

	Period in which Initial Treatment was Made.						
	1st Day.	2d Day.	3d Day.	4th Day.	5th Day.	6th Day & Over.	Total.
Total cases,	6,572	2,336	924	310	142	156	10,440
Recoveries,	6,128	2,114	785	256	107	104	9,494
Deaths,	444	222	139	54	35	52	946
Percentage of deaths,	6.75	9.50	15.04	17.42	24.65	33.33	9.06

TABLE II.

Antitoxin Treatment of Diphtheria for 1913.
Initial Dose 5000 Units.
Result of Treatment of Diphtheria with Antitoxin with Relation to Sex and Age.

	Sex.	Age Periods.										
		0-1	1-2	2-3	3-4	4-5	5-9	10-14	15-19	20+	Total	
Total cases,	M.,	77	249	428	468	535	1,884	668	245	390	4,944	
	F.,	52	189	340	449	457	1,966	802	387	854	5,496	10,440
Recoveries,	M.,	49	202	343	405	467	1,718	635	230	379	4,428	
	F.,	39	148	276	396	400	1,837	762	374	834	5,066	9,494
Deaths,	M.,	28	47	85	63	68	166	33	15	11	516	
	F.,	13	41	64	53	57	129	40	13	20	430	946

TABLE III.

Antitoxin Treatment of Diphtheria for 1913.
Initial Dose 5000 Units.
Result of Treatment of Diphtheria with Antitoxin According to Period of Initial Treatment after Onset and Age.

Period of Treatment.		Age Periods.									Total.	Percentage.
		0-1	1-2	2-3	3-4	4-5	5-9	10-14	15-19	20+		
1st day, ...	Total, ...	77	264	469	604	599	2,471	954	361	773	6,572	
	Recoveries,	56	221	400	535	554	2,331	920	350	761	6,128	
	Deaths, ...	21	43	69	69	45	140	34	11	12	444	6.75
2d day, ...	Total, ...	32	100	185	181	243	832	316	162	285	2,336	
	Recoveries,	21	77	144	159	203	772	302	157	279	2,114	
	Deaths, ...	11	23	41	22	40	60	14	5	6	222	9.50
3d day, ...	Total, ...	8	43	75	84	90	335	120	58	111	924	
	Recoveries,	5	33	53	69	66	290	112	54	103	785	
	Deaths, ...	3	10	22	15	24	45	8	4	8	139	15.04
4th day, ...	Total, ...	8	17	22	21	30	106	42	22	39	310	
	Recoveries,	3	10	15	21	21	90	38	19	39	256	
	Deaths, ...	5	7	7	3	9	16	4	3	0	54	17.42
5th day, ...	Total, ...	1	7	9	15	14	49	17	13	17	142	
	Recoveries,	1	4	3	12	9	38	11	13	16	107	
	Deaths, ...	0	3	6	3	5	11	6	0	1	35	24.65
6th day and over	Total, ...	3	7	8	9	16	57	21	16	19	156	
	Recoveries,	2	5	4	5	14	34	14	11	15	104	
	Deaths, ...	1	2	4	4	2	23	7	5	4	52	33.33
Total cases, ..	.....	....	....	....	....	....	.....	.....	.....	.....	10,440	
Total deaths,	.....	....	....	....	....	....	.....	.....	.....	.....	946	9.06

TABLE IV.

Antitoxin Treatment of Diphtheria for 1913.

Result of Treatment of Diphtheria with Antitoxin According to Number of Units Used and Areas Affected.

Units Used.		Regions Involved.															Total.	Percentage.
		Postnasal.	Pharyngeal.	Tonsillar.	Laryngeal.	All combined.	Pn. and Phar.	Pn., Phar., Ton.	Pn., Ton., Lar.	Pn. and Lar.	Ton. and Lar.	Ph., Ton., Lar.	Ph. and Ton.	Pn. and Ton.	Ph. and Lar.	Pn., Phar., Lar.		
1,000,	Total, ...	3	9	85	16	0	0	3	0	0	0	1	20	2	1	1	141	
	Recoveries,	3	8	83	8	0	0	1	0	0	0	1	18	2	0	1	125	
	Death, ...	0	1	2	8	0	0	2	0	0	0	0	2	0	1	0	16	11.35
2,000,	Total, ...	3	5	61	9	0	0	3	0	0	2	0	16	3	0	0	102	
	Recoveries,	3	4	60	7	0	0	1	0	0	1	0	16	3	0	0	95	
	Deaths, ...	0	1	1	2	0	0	2	0	0	1	0	0	0	0	0	7	6.86
2,500,	Total, ...	0	0	0	2	0	0	0	0	0	0	0	2	1	0	0	5	
	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	2	1	0	0	4	
	Deaths, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	20.00
3,000,	Total, ...	1	5	71	20	1	3	1	1	2	7	3	29	6	1	3	154	
	Recoveries,	1	5	68	9	1	3	1	0	2	6	3	27	6	0	3	135	
	Deaths, ...	0	0	3	11	0	0	0	1	0	1	0	2	0	1	0	19	12.34
3,500,	Total, ...	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	
	Recoveries,	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

	Total, ...	0	1	16	3	2	0	2	0	0	3	0	6	3	0	1	37		
4,000, ...	Recoveries,	0	1	16	3	2	0	2	0	0	3	0	6	3	0	1	37		
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	Total, ...	80	142	2,553	439	37	33	197	15	35	142	73	901	162	29	34	4,872		
5,000, ...	Recoveries,	76	133	2,527	320	20	31	177	12	29	126	49	876	145	20	31	4,572		
	Deaths, ...	4	9	26	119	17	2	20	3	6	16	24	25	17	9	3	300	6.16	
	Total, ...	6	6	77	14	2	1	14	0	0	7	8	29	7	3	1	175		
6,000, ...	Recoveries,	5	6	75	6	0	1	12	0	0	6	4	26	6	3	1	151		
	Deaths, ...	1	0	2	8	2	0	2	0	0	1	4	3	1	0	0	24	13.71	
	Total, ...	0	5	18	2	2	1	5	0	1	4	1	12	2	0	0	53		
7,000, ...	Recoveries,	0	4	17	2	1	1	4	0	1	3	1	9	2	0	0	45		
	Deaths, ...	0	1	1	0	1	0	1	0	0	1	0	3	0	0	0	8	15.09	
	Total, ...	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	3		
7,500, ...	Recoveries,	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	3		
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
	Total, ...	0	5	25	10	0	0	3	0	2	4	1	13	8	2	0	73		
8,000, ...	Recoveries,	0	4	24	8	0	0	3	0	1	2	0	13	7	2	0	64		
	Deaths, ...	0	1	1	2	0	0	0	0	1	2	1	0	1	0	0	9	12.33	
	Total, ...	2	1	9	8	0	1	2	1	0	2	3	5	3	2	1	40		
9,000, ...	Recoveries,	2	1	9	7	0	1	2	1	0	1	3	5	3	1	1	37		
	Deaths, ...	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	3	7.50	
	Total, ...	37	60	1,001	317	28	27	214	20	27	138	86	490	83	24	6	2,558		
10,000, ...	Recoveries,	30	52	981	243	19	20	175	14	22	114	58	478	71	17	4	2,298		
	Deaths, ...	7	8	20	74	9	7	39	6	5	24	28	12	12	7	2	260	10.16	
	Total, ...	1	2	19	10	1	0	5	1	0	4	2	4	5	2	2	58		
11,000, ...	Recoveries,	0	2	18	6	0	0	5	1	0	3	2	3	4	1	2	47		
	Deaths, ...	1	0	1	4	1	0	0	0	0	1	0	1	1	1	0	11	18.96	

TABLE IV—Continued.

Units Used.		Regions Involved.																Total.	Percentage.
		Postnasal.	Pharyngeal.	Tonsillar.	Laryngeal.	All combined.	Pn. and Phar.	Pn., Phar., Ton.	Pn., Ton., Lar.	Pn. and Lar.	Ton. and Lar.	Ph., Ton., Lar.	Ph. and Ton.	Pn. and Ton.	Ph. and Lar.	Pn., Phar., Lar.			
12,000,	Total, ...	0	0	11	2	1	0	2	0	0	2	2	3	2	0	0	25		
	Recoveries,	0	0	10	1	1	0	1	0	0	1	2	3	1	0	0	20		
	Deaths, ...	0	0	1	1	0	0	1	0	0	1	0	0	1	0	0	5	20.00	
13,000,	Total, ...	1	0	11	3	0	1	2	1	1	0	2	3	2	0	1	28		
	Recoveries,	1	0	11	2	0	1	2	0	1	0	2	3	2	0	1	26		
	Deaths, ...	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	7.14	
13,500,	Total, ...	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1		
	Recoveries,	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1		
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
14,000,	Total, ...	0	1	2	3	0	0	1	0	0	0	1	2	0	0	0	10		
	Recoveries,	0	1	2	3	0	0	0	0	0	0	1	2	0	0	0	9		
	Deaths, ...	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	10.00	
14,500,	Total, ...	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1		
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Deaths, ...	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	100.00	

	Total, ...	13	35	352	146	22	12	95	4	10	59	43	158	42	18	4	903	
15,000, ...	Recoveries,	10	34	233	112	16	9	85	3	10	52	37	156	38	15	4	804	
	Deaths, ...	3	1	19	34	6	3	10	1	0	7	6	2	4	3	0	99	10.96
	Total, ...	1	0	6	1	2	0	3	0	0	3	3	4	0	0	1	24	
16,000, ...	Recoveries,	1	0	6	1	1	0	3	0	0	1	3	4	0	0	1	21	
	Deaths, ...	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	3	12.50
	Total, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
16,500, ...	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	100.00
	Total, ...	0	1	1	2	2	0	2	0	0	2	0	0	0	0	0	10	
17,000, ...	Recoveries,	0	1	1	1	2	0	2	0	0	2	0	0	0	0	0	9	
	Deaths, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	10 00
	Total, ...	0	0	5	3	1	1	0	0	0	0	0	5	0	1	0	16	
18,000, ...	Recoveries,	0	0	5	2	0	0	0	0	0	0	0	3	0	1	0	11	
	Deaths, ...	0	0	0	1	1	1	0	0	0	0	0	2	0	0	0	5	31.25
	Total, ...	0	0	1	1	0	0	1	0	0	1	1	2	0	0	0	7	
19,000, ...	Recoveries,	0	0	1	1	0	0	1	0	0	1	0	2	0	0	0	6	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	14.28
	Total, ...	10	16	113	94	15	3	75	0	2	39	33	98	15	18	3	534	
20,000, ...	Recoveries,	10	16	110	68	10	2	60	0	2	30	26	96	11	15	1	457	
	Deaths, ...	0	0	3	26	5	1	15	0	0	9	7	2	4	3	2	77	14.42
	Total, ...	1	0	2	3	0	0	1	1	0	0	0	1	1	0	0	10	
21,000, ...	Recoveries,	1	0	2	2	0	0	0	1	0	0	0	1	1	0	0	8	
	Deaths, ...	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	20 00
	Total, ...	1	0	2	0	0	0	2	0	1	0	0	1	0	0	0	7	
22,000, ...	Recoveries,	1	0	2	0	0	0	0	0	1	0	0	1	0	0	0	5	
	Deaths, ...	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	28.57

TABLE IV—Continued.

Units Used.		Regions Involved.																Total.	Percentage.
		Postnasal.	Pharyngeal.	Tonsillar.	Laryngeal.	All combined.	Pn. and Phar.	Pn., Phar., Ton.	Pn., Ton., Lar.	Pn. and Lar.	Ton. and Lar.	Ph., Ton., Lar.	Ph. and Ton.	Pn. and Ton.	Ph. and Lar.	Pn., Phar., Lar.			
22,500,	Total, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1		
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Deaths, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	100.00	
23,000,	Total, ...	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	6		
	Recoveries,	0	0	2	3	0	0	0	0	0	0	0	0	1	0	0	6		
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
24,000,	Total, ...	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	3		
	Recoveries,	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	3		
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
25,000,	Total, ...	5	2	33	44	10	2	26	1	1	13	11	30	12	10	2	201		
	Recoveries,	5	2	28	37	6	2	20	0	1	13	10	29	10	8	2	172		
	Deaths, ...	0	0	4	7	4	0	6	1	0	1	1	1	2	2	0	29	14.43	
26,000,	Total, ...	0	0	1	1	0	0	1	0	0	1	1	1	0	1	0	7		
	Recoveries,	0	0	0	1	0	0	1	0	0	1	1	1	0	1	0	6		
	Deaths, ...	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	14.28	

27,000,	Total,	0	0	3	0	0	0	2	0	0	0	1	1	0	0	8	12.50
	Recoveries,	0	0	3	0	0	0	1	0	0	0	1	1	0	0	7	
	Deaths,	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
27,500,	Total,	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.0
	Recoveries,	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
28,000,	Total,	0	0	0	2	1	1	1	0	1	0	0	0	0	0	6	33.33
	Recoveries,	0	0	0	2	0	1	1	0	0	0	0	0	0	0	4	
	Deaths,	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2	
29,000,	Total,	0	0	1	1	1	0	1	0	1	0	0	0	0	0	4	25.00
	Recoveries,	0	0	1	0	0	0	1	0	0	0	0	0	0	0	3	
	Deaths,	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	
29,500,	Total,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	100.00
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	
30,000,	Total,	0	2	18	21	3	4	21	1	0	12	11	20	3	1	117	15.38
	Recoveries,	0	2	17	17	2	4	18	1	0	7	8	19	3	1	99	
	Deaths,	0	0	1	4	1	0	3	0	0	5	3	1	0	0	18	
31,000,	Total,	0	0	0	1	0	0	0	0	0	0	2	0	1	0	4	25.00
	Recoveries,	0	0	0	1	0	0	0	0	0	6	1	0	1	0	3	
	Deaths,	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
32,000,	Total,	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0.0
	Recoveries,	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
33,000,	Total,	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	0.0
	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TABLE IV—Continued.

Units Used.		Regions Involved.															Total.	Percentage.
		Postnasal.	Pharyngeal.	Tonsillar.	Laryngeal.	All combined.	Pn. and Phar.	Pn., Phar., Ton.	Pn., Ton., Lar.	Pn. and Lar.	Ton. and Lar.	Ph., Ton., Lar.	Ph. and Ton.	Pn. and Ton.	Ph. and Lar.	Pn., Phar., Lar.		
34,000,	Total, ...	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2	
	Recoveries,	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	50.00
35,000,	Total, ...	1	0	8	9	6	2	7	2	1	6	2	9	4	1	0	58	
	Recoveries,	1	0	7	9	3	2	5	1	1	6	2	9	4	0	0	50	
	Deaths, ...	0	0	1	0	3	0	2	1	0	0	0	0	0	1	0	8	13.79
36,000,	Total, ...	0	0	0	0	0	1	2	0	0	0	0	1	0	0	0	4	
	Recoveries,	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	3	
	Deaths, ...	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	25.00
37,000,	Total, ...	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	
	Recoveries,	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
38,000,	Total, ...	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	50.00

39,000,	Total,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
40,000,	Total,	0	1	9	9	3	0	9	1	0	3	5	14	4	2	0	60	
	Recoveries,	0	1	9	7	1	0	7	1	0	2	4	13	3	2	0	50	
	Deaths,	0	0	0	2	2	0	2	0	0	1	1	1	1	0	0	10	16.67
41,000,	Total,	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Recoveries,	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
44,000,	Total,	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
44,500,	Total,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
45,000,	Total,	0	0	4	6	2	0	5	1	0	3	0	1	0	0	1	23	
	Recoveries,	0	0	4	5	2	0	5	1	0	3	0	0	0	0	1	21	
	Deaths,	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	8.69
48,000,	Total,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
49,000,	Total,	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
	Deaths,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
50,000,	Total,	0	0	4	4	2	0	2	0	1	2	2	3	1	0	2	23	
	Recoveries,	0	0	4	3	1	0	2	0	1	2	2	3	1	0	1	20	
	Deaths,	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	3	13.04

TABLE IV—Continued.

Units Used.		Regions Involved.															Total.	Percentage.
		Postnasal.	Pharyngeal.	Tonsillar.	Laryngeal.	All combined.	Pn. and Phar.	Pn., Phar., Ton.	Pn., Ton., Lar.	Pn. and Lar.	Ton. and Lar.	Ph., Ton., Lar.	Ph. and Ton.	Pn. and Ton.	Ph. and Lar.	Pn., Phar., Lar.		
	Total, ...	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
54,000, ...	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths, ...	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	100.00
	Total, ...	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	4	
55,000, ...	Recoveries,	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	4	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total, ...	0	0	0	0	2	0	5	2	0	0	1	0	1	0	0	11	
60,000, ...	Recoveries,	0	0	0	0	1	0	5	2	0	0	1	0	1	0	0	10	
	Deaths, ...	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	9.09
	Total, ...	0	0	1	0	0	0	2	0	0	0	0	1	1	0	0	5	
65,000, ...	Recoveries,	0	0	1	0	0	0	1	0	0	0	0	1	1	0	0	4	
	Deaths, ...	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	20.00
	Total, ...	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	
66,000, ...	Recoveries,	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

	Total, ...	0	0	0	0	0	0	2	0	0	0	2	1	0	0	0	5	
70,000, ...	Recoveries,	0	0	0	0	0	0	2	0	0	0	2	1	0	0	0	5	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total, ...	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	
73,000, ...	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Deaths, ...	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	100.00
	Total, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
75,000, ...	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total, ...	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	3	
80,000, ...	Recoveries,	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	
	Deaths, ...	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	66.67
	Total, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
84,000, ...	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total, ...	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	4	
85,000, ...	Recoveries,	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	3	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	25.00
	Total, ...	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	
100,000, ...	Recoveries,	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total, ...	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
105,000, ...	Recoveries,	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total, ...	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
110,000, ...	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

TABLE IV—Continued.

Units Used.		Regions Involved.																Total.	Percentage.
		Postnasal.	Pharyngeal.	Tonsillar.	Laryngeal.	All combined.	Pn. and Phar.	Pn., Phar., Ton.	Pn., Ton., Lar.	Pn. and Lar.	Ton. and Lar.	Ph., Ton., Lar.	Ph. and Ton.	Pn. and Ton.	Ph. and Lar.	Pn., Phar., Lar.			
115,000,	Total, ...	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		1	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0.0
130,000,	Total, ...	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		2	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		2	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0.0
170,000,	Total, ...	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		1	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0.0
185,000,	Total, ...	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		1	
	Recoveries,	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0.0
295,000,	Total, ...	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		1	
	Recoveries,	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		1	
	Deaths, ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0.0

Total, ...	Total, ...	167	289	4,430	1,222	148	93	725	55	84	463	397	1,599	376	118	64	10,410								
	Recoveries,	151	267	4,343	908	91	78	614	38	72	387	228	1,541	332	89	55	9,494								
	Deaths, ...	16	22	87	314	57	15	111	17	12	76	79	58	44	29	9	946								
Percentage, ...		9.58	7.61	1.96	25.69	38.51	16.13	15.31	30.91	14.28	16.41	25.73	3.05	11.70	24.58	14.06	9.06								

Table V, showing result of immunization for the year, requires no comment.

TABLE V.

IMMUNIZATION—1913.

Number immunized.	Units used.	Number not developing diphtheria.	Number developing diphtheria.	Percentage.
2	200	2	0	0.0
2	250	2	0	0.0
1	300	1	0	0.0
2	400	2	0	0.0
146	500	146	0	0.0
3	600	3	0	0.0
3	700	3	0	0.0
3	750	3	0	0.0
5	800	5	0	0.0
8,823	1,000	8,709	114	1.29
4	1,200	4	0	0.0
30	1,500	30	0	0.0
4	1,800	4	0	0.0
175	2,000	168	7	4.00
63	2,500	63	0	0.0
57	3,000	57	0	0.0
422	5,000	418	4	0.95
3	6,000	3	0	0.0
22	10,000	22	0	0.0
3	15,000	3	0	0.0
1	18,000	1	0	0.0
1	20,000	1	0	0.0
9,775		9 ,650	125	1.28

TETANUS ANTITOXIN.

METHOD OF DISTRIBUTION.

Tetanus Antitoxin in immunizing doses of 1,500 units is distributed by the Department of Health under the same conditions as is Diphtheria Antitoxin. This distribution was begun shortly before July 4th, 1910, through sixty-seven Distributors. The Antitoxin was again supplied to the Distributors in ample time for use on July 4th, 1912,

during which year another Distributor was appointed, making the total sixty-eight, which was not changed in 1913. These sixty-eight Distributors were selected from among the Distributors of Diphtheria Antitoxin already appointed by the Commissioner of Health. Tetanus Antitoxin being effective when used within forty-eight hours after the injury is received, the object was, therefore, so to choose these distirbuting stations that the Antitoxin would be accessible to all persons meeting with accidents in any part of Pennsylvania within the prescribed time, and the entire State, in the judgment of the Commissioner of Health could be properly cared for by sixty-eight stations if carefully placed. Those Diphtheria Antitoxin stations from which Tetanus Antitoxin is also issued are marked on the map to which reference has already been made.

Form B. P. 536 is the numbered Application and Receipt, yellow in color, to be signed by the Physician upon making application to the Distributor for the Antitoxin for use in indigent patients, a stub of which, blue in color, remains fastened in the book of the Distributor for his record.

Form B. P. 537 is the little yellow slip found around the outside of the package of Antitoxin which is to be filled out by the Physician, giving name of patient and address, date of use, physician's name and address, and forwarded with Form B. P. 536 above mentioned to the Department.

Form B. P. 538, being the clinical report, gives the complete medical record or history of the case from the beginning of treatment to either recovery or death and is to be signed by the Physician and sent to the Department immediately upon termination of the case.

These three forms when properly filled out make a complete record of each case.

Forms B. P. 536-538 are also filled out whenever the Antitoxin is used for a curative treatment of Tetanus, and the physician administers as many of the immunizing doses as the case may require, or, at his request, larger doses for curative use are specially supplied.

Form B. P. 536.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.

APPLICATION AND RECEIPT FOR TETANUS ANTITOXIN.

.....19.....

I hereby acknowledge the receipt of the following named amount of Tetanus Antitoxin: ..... packages containing 1500 units. Laboratory Nos. .....
from .....Distributor. Address, ...
in the name of the Department of Health. I hereby certify that the persons mentioned for whose treatment the Antitoxin is furnished are indigent and unable to otherwise procure the same. I agree to make no charge for it directly or indirectly, and if unused to return it to the Distributor; also to mail to the Department of

Health, immediately upon termination, a clinical report for each case, on the blanks furnished for this purpose.

We have in stock at this time:
..... packages 1500 units.

.....
(Physician Signature.)
.....
(Address.)

.....
(Distributor's Signature.)
.....
(Full Address.)

When the physician signs this receipt a sheet of carbon paper also puts his signature on the blue "stub" of Form 536, which is identical in language with the receipt and bears the same number for identification.

Form B. P. 537.

Form B. P. 537.

Tetanus Antitoxin.
..... Units
Manufacturer.
.....
Laboratory No. .....
Date within which the unopened container or attached slip must be returned to
Distributor .....
.....

COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF HEALTH.

Tetanus Antitoxin, ...Units.
Manufacturer, ...Laboratory No. .....
Patient, ... Address, ...
Date of use, ...
Physician's signature, ...
Physicain's address, ...
Distributor's signature, ...
Distributor's address, ...
This slip when returned to Distributor must be forwarded by him to the Department of Health, together with the application for the same.

SAMUEL G. DIXON, Commissioner.

Form B. P. 538.

COMMONWEALTH OF PENNSYLVANIA.
DEPARTMENT OF HEALTH.

REPORT OF PROPHYLATIC TREATMENT WITH TETANUS ANTITOXIN.

Use a separte blank for each case and forward immediately upon the termination of the same to the Department of Health, Harrisburg, Pa.

Patient's name, ... Address, ... County, ... Pa.
Age, ... Sex, ... Color, ...
Nature of wound, ... Gunshot, ... Puncture, ... Other Injury, ...
(Cross out class of injury not applicable.)
Location and extent of wound, ...
.....
Cause of injury, ...
Date and hour of accident, ...
(Hour) (Day) (Month) (Year)

SPECIFY AMOUNT OF ANTITOXIN USED.

.....Units,.....hours after accident. Lab. No.....
.....Units,.....hours after first treatment. Lab. No.....
.....Units,.....hours after second treatment. Lab. No.....

State complications if any.....
Did patient subsequently develop tetanus? Yes. No. State termination: Recovery, Death with date,
Remarks, ...
.....
Distributor's Name, ... Signature, ...M. D.
Address, ... Address, ...

The following statements give a concise summary of the whole number of cases treated with Tetanus Antitoxin for Immunization and Cure, number of deaths, number of recoveries, number of packages used, initial number of packages supplied to the Stations, and net cost of supplying the same for the years 1910, 1911, 1912 and 1913:—

1910.

Total number of cases treated for cure,	16
Number of deaths,	14
Number of recoveries,	2
Number immunized,	76
Number immunized and developing tetanus,	0
Total number treated for cure or immunization,	92
Total number of packages of Antitoxin used in 1910,	241
Initial supply of packages to sixty-seven distributing stations,	611
Net cost of supplying to sixty-seven distributing stations,	$722.40

1911.

Total number of cases treated for cure,	27
Number of deaths,	21
Number of recoveries,	6
Number immunized,	83
Number immunized and developing tetanus,	0
Total number treated for cure or immunization,	110
Total number of packages of Antitoxin used in 1911,	202
Additional supplies of packages to thirty distributing stations,	144
Refrigerator stock,	100
Net cost of supplying to thirty distributing stations,	$292.80

1912.

Total number of cases treated for cure,	14
Number of deaths,	9
Number of recoveries,	5
Number immunized,	40
Number immunized and developing tetanus,	0
Total number treated for cure or immunization,	54
Total number of packages of Antitoxin used in 1912,	122
Additional supplies of packages to fifty-two distributing stations,	164
Refrigerator stock,	106
Net cost of supplying to fifty-two distributing stations,	$69.60

1913.

Total number of cases treated for cure,	8
Number of deaths,	5
Number of recoveries,	3
Number immunized,	107
Number immunized and developing tetanus,	0
Total number treated for cure or immunization,	115
Number of packages supplied,	216
Additional packages supplied for emergency case (25,000 Units),	2
Additional packages supplied for emergency case (50,000 Units),	2
Number of packages used,	133
Number of packages used in emergency case (25,000 Units),	1
Number of packages used in emergency case (50,000 Units),	2
Refrigerator stock, (1500 Unit Syringes),	24
Net cost,	$199.31

The total number of cases treated during the year was 115, as against 100 in the previous year, 107 of which were immunized and eight treated for cure. Out of the total number of cases immunized, being 107, not one single case developed Tetanus. Of the eight cases treated for cure with immunizing or larger doses of Tetanus Antitoxin where Tetanus existed, three recovered and five died.

The total number of packages of 1,500 units, or immunizing doses, of Tetanus Antitoxin used during the year was one hundred and thirty-eight (138) or two hundred and seven thousand (207,000) units; one package of 25,000 units and two packages of 50,000 units were used in cases treated for cure.

The following tables of curative and immunization treatment with Tetanus Antitoxin give age, sex and color of patients; Nature of wound; Time of treatment after the accident; Number of cases, and number of units used for the year 1913.

TABLE SHOWING RESULTS OF CURATIVE TREATMENT OF TETANUS CASES WITH ANTITOXIN FOR THE YEAR 1913.

Age.	Sex.		Color.		Nature of Wound.			Fourth of July.	Previous to and after July fourth.	Treatment Began.		Number of units used.	Result.	
	Male.	Female.	White.	Black.	Gunshot.	Puncture.	Other injuries.			Within 48 hours.	Over 48 hours.		Recovery.	Death.
32,	1	....	1	....	....	1	....	....	1	....	1	7,500	....	1
10,	1	....	1	....	1	....	....	....	1	1	....	3,000	....	1
41,	1	....	....	1	....	....	1	....	1	1	....	[1]105,000	....	1
45,	1	....	1	....	....	....	1	....	1	....	1	[2]34,000	1	....
8,	....	1	1	....	....	1	....	....	1	....	1	3,000	....	1
12,	....	1	1	....	....	....	1	....	1	....	1	4,500	1	....
58,	1	....	1	....	....	....	1	....	1	1	....	[3]37,500	....	1
27,	....	1	1	....	1	....	....	1	....	....	1	1,500	1	....
	5	3	7	1	2	2	4	1	7	3	5	196,000	3	5

[1] 2 packages 50,000 State Antitoxin; 5,000 secured elsewhere.
[2] 1 package 25,000 units.
[3] 6,000 units, or 4 packages 1,500, State Antitoxin; remainder secured elsewhere.

STATEMENT OF IMMUNIZATION TREATMENT WITH TETANUS ANTITOXIN FOR THE YEAR 1913.

Age.	Sex.		Color.		Nature of Wound.			Fourth of July.	Previous to and after July fourth.	Treatment Began.		Number of units used.
	Male.	Female.	White.	Black.	Gunshot.	Puncture.	Other injuries.			Within 48 hours.	Over 48 hours.	
16,	1	....	1	....	....	1	....	....	1	....	1	1,500
12,	1	....	1	....	....	....	1	1	....	1	....	1,500
10,	....	1	1	....	....	1	....	....	1	1	....	1,500
16,	1	....	1	....	1	....	....	1	....	1	....	1,500
35,	1	....	1	....	....	....	1	1	....	1	....	1,500
4,	1	....	1	....	....	1	....	....	1	1	....	1,500
15,	1	....	1	....	....	....	1	1	....	1	....	1,500
15,	1	....	1	....	1	....	....	1	....	1	....	1,500
11,	1	....	1	....	....	1	....	....	1	1	....	1,500
14,	1	....	1	....	....	....	1	1	....	1	....	1,500
12,	1	....	1	....	....	....	1	....	1	1	....	1,500
36,	1	....	1	....	....	....	1	1	....	1	....	1,500
7,	1	....	1	....	....	....	1	1	....	1	....	1,500
16,	1	....	1	....	1	....	....	1	....	1	....	1,500
12,	....	1	1	....	....	....	1	1	....	1	....	1,500
11,	....	1	1	....	....	....	1	1	....	1	....	1,500
17,	1	....	1	....	1	....	....	....	1	1	....	3,000
10,	....	1	1	....	....	....	1	1	....	1	....	1,500
14,	1	....	1	....	1	....	....	....	1	1	....	1,500
14,	1	....	1	....	....	1	....	....	1	....	1	3,000
15,	1	....	1	....	1	....	....	....	1	1	....	1,500
10,	1	....	1	....	....	1	....	1	....	1	....	1,500
33,	1	....	1	....	1	....	....	....	1	1	....	1,500
32,	1	....	1	....	....	1	....	....	1	1	....	1,500
9,	1	....	1	....	1	....	....	1	....	1	....	1,500
14,	1	....	1	....	1	....	....	....	1	1	....	1,500
6,	1	....	1	....	....	1	....	....	1	1	....	1,500
10,	1	....	1	....	....	....	1	....	1	1	....	1,500
34,	1	....	....	1	....	....	1	....	1	....	1	1,500
6,	....	1	1	....	....	....	1	....	1	1	....	1,500
70,	1	....	1	....	....	1	....	1	....	1	....	1,500
80,	1	....	1	....	....	....	1	....	1	1	....	1,500
73,	1	....	1	....	....	....	1	....	1	1	....	1,500
42,	1	....	1	....	....	....	1	....	1	1	....	1,500
66,	1	....	1	....	....	....	1	....	1	1	....	1,500
33,	1	....	1	....	....	....	1	1	....	1	....	1,500
66,	1	....	1	....	....	....	1	....	1	1	....	1,500
13,	1	....	1	....	....	1	....	1	....	1	....	1,500
7,	1	....	1	....	....	1	....	....	1	1	....	1,500
28,	1	....	1	....	....	....	1	....	1	....	1	1,500
11,	1	....	1	....	1	....	....	1	....	1	....	1,500
39,	1	....	....	1	....	1	....	....	1	1	....	1,500
17,	1	....	1	....	1	....	....	1	....	1	....	1,500
26,	1	....	1	....	....	1	....	....	1	1	....	1,500
20,	1	....	1	....	1	....	....	1	....	1	....	1,500
18,	1	....	1	....	1	....	....	....	1	1	....	1,500
7,	....	1	1	....	1	....	....	....	1	1	....	1,500
15,	1	....	1	....	1	....	....	....	1	1	....	1,500
10,	1	....	1	....	1	....	....	1	....	....	1	3,000
16,	1	....	1	....	....	....	1	....	1	1	....	1,500
10,	....	1	1	....	....	....	1	....	1	....	1	3,000
15,	1	....	1	....	....	1	....	....	1	1	....	1,500
11,	1	....	1	....	....	....	1	1	....	1	....	1,500
12,	1	....	1	....	1	....	....	....	1	1	....	1,500
13,	1	....	1	....	....	1	....	1	....	1	....	1,500
12,	1	....	1	....	1	....	....	1	....	1	....	1,500
4,	1	....	1	....	....	....	1	1	....	1	....	1,500
29,	1	....	1	....	....	....	1	1	....	....	1	3,000
37,	1	....	1	....	....	1	....	....	1	1	....	1,500
9,	1	....	1	....	....	1	....	....	1	1	....	1,500
13,	1	....	1	....	....	....	1	....	1	1	....	1,500
4,	1	....	1	....	....	....	1	....	1	1	....	1,500
28,	1	....	1	....	....	....	1	....	1	1	....	1,500
15,	1	....	1	....	....	....	1	....	1	1	....	1,500
7,	1	....	1	....	....	....	1	....	1	....	1	1,500
58,	1	....	1	....	....	....	1	....	1	....	1	1,500
33,	....	1	1	....	1	....	....	....	1	....	1	1,500
37,	1	....	1	....	1	....	....	....	1	1	....	1,500

STATEMENT OF IMMUNIZATION TREATMENT WITH TETANUS ANTITOXIN FOR THE YEAR 1913—Continued.

Age.	Sex.		Color.		Nature of Wound.			Fourth of July.	Previous to and after July fourth.	Treatment Began.		Number of units used.
	Male.	Female.	White.	Black.	Gunshot.	Puncture.	Other injuries.			Within 48 hours.	Over 48 hours.	
22,	1	....	1	....	....	....	1	....	1	1	....	1,500
8,	1	....	1	....	1	....	....	....	1	1	....	3,000
45,	1	....	1	....	....	1	....	....	1	1	....	1,500
35,	1	....	1	....	1	....	....	....	1	1	....	1,500
13,	1	....	1	....	1	....	....	1	....	1	....	1,500
19,	1	....	1	....	1	....	....	1	....	1	....	1,500
28,	1	....	1	....	....	1	....	....	1	1	....	3,000
14,	1	....	1	....	....	1	....	....	1	1	....	1,500
11,	....	1	1	....	....	1	....	....	1	....	1	1,500
5,	1	....	1	....	....	....	1	....	1	1	....	1,500
6,	1	....	1	....	1	....	....	....	1	1	....	1,500
34,	1	....	1	....	....	1	....	....	1	1	....	1,500
12,	1	....	1	....	....	....	1	....	1	1	....	1,500
11,	1	....	1	....	....	....	1	1	....	....	1	1,500
13,	1	....	1	....	....	....	1	1	....	1	....	1,500
19,	1	....	1	....	1	....	....	1	....	1	....	1,500
14,	1	....	1	....	1	....	....	....	1	1	....	1,500
18,	1	....	1	....	1	....	....	1	....	1	....	1,500
10,	1	....	1	....	....	....	1	1	....	1	....	1,500
36,	....	1	1	....	....	1	....	....	1	1	....	1,500
10,	1	....	1	....	....	1	....	....	1	1	....	1,500
42,	1	....	1	....	1	....	....	....	1	....	1	3,000
11,	1	....	1	....	1	....	....	....	1	....	1	1,500
10,	1	....	1	....	....	....	1	....	1	1	....	1,500
17,	1	....	1	....	1	....	....	1	....	1	....	1,500
30,	1	....	1	....	....	....	1	1	....	1	....	1,500
18,	1	....	1	....	....	....	1	1	....	1	....	1,500
16,	1	....	1	....	....	....	1	1	....	1	....	1,500
12,	1	....	1	....	....	....	1	1	....	1	....	1,500
10,	1	....	1	....	....	1	....	1	....	1	....	1,500
11,	1	....	1	....	....	....	1	....	1	1	....	1,500
14,	1	....	1	....	1	....	....	....	1	1	....	1,500
10,	1	....	1	....	1	....	....	....	1	1	....	1,500
8,	1	....	1	....	....	....	1	1	....	1	....	1,500
8,	1	....	1	....	....	1	....	1	....	....	1	1,500
14,	1	....	1	....	1	....	....	1	....	1	....	1,500
10,	1	....	1	....	....	....	1	1	....	1	....	1,500
41,	1	....	1	....	....	....	1	1	....	1	....	1,500
12,	1	....	1	....	....	....	1	1	....	1	....	1,500
	97	10	105	2	34	26	47	45	62	92	15	172,500

TUBERCLE BACILLI PRODUCTS.

The Department of Health, through the Division of Distribution of Biological Products, began June 29, 1909, the distribution of Tubercle Bacilli Extract and Suspension of Dead Tubercle Bacilli to the physicians in charge of Dispensaries for the treatment of tuberculosis among the indigent throughout the State of Pennsylvania.

At that time both the Tubercle Bacilli Extract and the Suspension of Dead Tubercle Bacilli were manufactured and put up in syringes containing only Dilutions from No. 1 to No. 10, inclusive, but on August 4, 1910, the number of Dilutions used in the treatment of tuberculosis was increased by the addition of Dilutions No. 11 to No. 16, in both the Extract and Suspension, and since that time the number of Dilutions in the Extract has been increased to No. 20. They have been quite extensively used during the year 1913 at the Mont Alto and Cresson Sanatoria as well as by the Physicians in charge of forty-two out of the 115 State Tuberculosis Dispensaries for the treatment of tuberculous patients.

At these forty-two Dispensaries during the year 1913, the Tubercle Bacilli Products were used in 374 cases, as compared with 333 during the year 1912, while at the Pennsylvania State Sanatorium for Tuberculosis, No. 1, at Mont Alto, the products were used in 305 cases during 1913, as compared with 350 cases during the year 1912; and at No. 2, Cresson, during the year 1913, the Products were used in 358 cases, this Sanatorium having been opened for the admission of patients at the beginning of the year.

The total number of patients thus treated during the year 1913 at the Dispensaries and the Sanatoria was consequently 1,137, as compared with 683 during the year 1912.

INSTRUCTIONS REGARDING THE USE OF TUBERCLE BACILLI PRODUCTS.

To the Medical Staff of the Department:

Gentlemen:—In the use of the Suspension of Dead Tubercle Bacilli and Tubercle Bacilli Extract for the treatment of tuberculosis by cell immunization, the patients should be carefully selected, as my preparations are not supposed to be of value in all cases. The best results are to be expected in patients who have a small amount of tissue involvement and in whom the body cells have not become saturated with the toxin. To-day I am pursuing exactly the same principle of treatment with the dead bacilli in place of the involution forms as I did in 1889, *i. e.*, with small graduated doses with a progressive increase of strength to produce, by degrees, an increased power of the tissues to resist the action of the tubercle bacilli. During the early use of all preparations made directly from tubercle bacilli some of the medical profession made grave mistakes, and by administering large and too frequent doses they killed the tissues, and often caused general tuberculosis. In this way a hypersusceptibility was maintained at all times.

THESE PRODUCTS ARE PREPARED IN THE FOLLOWING STRENGTHS.

SUSPENSION OF DEAD TUBERCLE BACILLI.

This Suspension is supplied in the following series of dilutions, so that the doses may be increased as deemed advisable:

Dilution No. 1, containing one one-thousands of a milligram (0.000,001 gram) of dead tubercle bacilli.
Dilution No. 2, containing one one-hundredth of a milligram (0.000,01 gram) of dead tubercle bacilli.
Dilution No. 3, containing two one-hundredths of a milligram (0.000,02 gram) of dead tubercle bacilli.
Dilution No. 4, containing three one-hundredths of a milligram (0.000,03 gram) of dead tubercle bacilli.
Dilution No. 5, containing four one-hundredths of a milligram (0.000,04 gram) of dead tubercle bacilli.
Dilution No. 6, containing five one-hundredths of a milligram (0.000,05 gram) of dead tubercle bacilli.
Dilution No. 7, containing six one-hundredths of a milligram (0.000,06 gram) of dead tubercle bacilli.
Dilution No. 8, containing seven one-hundredths of a milligram (0.000,07 gram) of dead tubercle bacilli.
Dilution No. 9, containing eight one-hundredths of a milligram (0.000,08 gram) of dead tubercle bacilli.
Dilution No. 10, containing nine one-hundredths of a milligram (0.000,09 gram) of dead tubercle bacilli).
Dilution No. 11, containing ten one-hundredths of a milligram (0.000,10 gram) of dead tubercle bacilli.
Dilution No. 12, containing eleven one-hundredths of a milligram (0.000,11 gram) of dead tubercle bacilli.
Dilution No. 13, containing twelve one-hundredths of a milligram (0.000,12 gram) of dead tubercle bacilli.
Dilution No. 14, containing thirteen one-hundredths of a milligram (0.000,13 gram) of dead tubercle bacilli.
Dilution No. 15, containing fourteen one-hundredths of a milligram (0.000,14 gram) of dead tubercle bacilli.
Dilution No. 16, containing fifteen one-hundredths of a milligram (0.000,15 gram) of dead tubercle bacilli.

TUBERCLE BACILLI EXTRACT.

This extract is supplied in the following series of dilutions, so that the doses may be increased as deemed advisable:

Dilution No. 1, containing the extract from one milligram (0.001 gram) of tubercle bacilli.
Dilution No. 2, containing the extract from ten milligrams (0.01 gram) of tubercle bacilli.
Dilution No. 3, containing the extract from twenty milligrams (0.02 gram) of tubercle bacilli.
Dilution No. 4, containing the extract from thirty milligrams (0.03 gram) of tubercle bacilli.
Dilution No. 5, containing the extract from forty milligrams (0.04 gram) of tubercle bacilli.
Dilution No. 6, containing the extract from fifty milligrams (0.05 gram) of tubercle bacilli.
Dilution No. 7, containing the extract from sixty milligrams (0.06 gram) of tubercle bacilli.
Dilution No. 8, containing the extract from seventy milligrams (0.07 gram) of tubercle bacilli.
Dilution No. 9, containing the extract from eighty milligrams (0.08 gram) of tubercle bacilli.
Dilution No. 10, containing the extract from ninety milligrams (0.09 gram) of tubercle bacilli.
Dilution No. 11, containing the extract from 100 milligrams (0.10 gram) of tubercle bacilli.
Dilution No. 12, containing the extract from 110 milligrams (0.11 gram) of tubercle bacilli.
Dilution No. 13, containing the extract from 120 milligrams (0.12 gram) of tubercle bacilli.
Dilution No. 14, containing the extract from 130 milligrams (0.13 gram) of tubercle bacilli.

Dilution No. 15, containing the extract from 140 milligrams (0.14 gram) of tubercle bacilli.
Dilution No. 16, containing the extract from 150 milligrams (0.15 gram) of tubercle bacilli.
Dilution No. 17, containing the extract from 160 milligrams (0.16 gram) of tubercle bacilli.
Dilution No. 18, containing the extract from 170 milligrams (0.17 gram) of tubercle bacilli.
Dilution No. 19, containing the extract from 180 milligrams (0.18 gram) of tubercle bacilli.
Dilution No. 20, containing the extract from 190 milligrams (o.19 gram) of tubercle bacilli.*

Each dose of the various dilutions is supplied in a syringe ready for direct injection, and contains the strengths as above indicated. You should begin with Dilution No. 1 of the Suspension of Dead Tubercle Bacilli (0.000,001 gram) or of the Tubercle Bacilli Extract (0.001 gram). This injection may be repeated at five-day intervals and if, after five injections, there is very little or no reaction, the treatment with No. 2—Suspension of Dead Tubercle Bacilli (0.000,01 gram) or Tubercle Bacilli Extract (0.01 gram)—should be undertaken. If after five injections at five-day intervals this should not produce any material reaction, a series of five injections of No. 3,—Suspension of Dead Tubercle Bacilli (0.000,02 gram), or Tubercle Bacilli Extract (0.02) gram) may be given; then No. 4,—Suspension of Dead Tubercle Bacilli (0.000,03 gram) or Tubercle Bacilli Extract (0.03 gram); following then with No. 5—Suspension of Dead Tubercle Bacilli (0.000,-04 gram) or Tubercle Bacilli Extract (0.04 gram)—and so on, up to strength No. 16 in the Suspension of Dead Tubercle Bacilli or to strength No. 20 in the Tubercle Bacilli Extract, watching, of course, for a reaction which should always govern the treatments.

The physician in charge should use his judgment as to how the patient feels in general, depending, of course, upon the manifestations of each one's condition as to the strength, the weight, the sleep, the circulation, the appetite, the cough and the temperature. When these are good, the patient presents a good picture along the line of recovery, and moderate reaction may be tolerated. It should be the aim of the physician administering the treatment to increase the dosage with such care as not to produce a severe reaction during the entire time of treatment. However, if a severe reaction should occur, it is advisable to return to the next, or possibly even the second weaker dilution.

SAMUEL G. DIXON,
Commissioner.

*By the weight of the bacilli in these dilutions is meant the weight of the organisms after prolonged treatment with ether to remove the "wax."

The Extract and the Suspension for the treatment of patients of the Dispensaries are obtained by direct application to the Department. When a supply of Tubercle Bacilli Products reaches a Dispensary the physician in charge signs a simple receipt, Form B. P. 508, indicating the number and strength of the products which have been delivered for the use of this Dispensary under his charge. As the material is used the physician at once makes a report to the Department on a special slip, Form B. P. 501, if he have used the Extract, as follows:

Form B. P. 501.
TUBERCLE BACILLI EXTRACT.

Gram, ...
Dil. No. .....
Lab. No. .....Exp. .....

Manufacturer.

.....

Dispensary No. .....

.....

Form B. P. 501.
COMMONWEALTH OF PENNSYLVANIA,
DEPARTMENT OF HEALTH.

Tubercle Bacilli Extract, Dil. No.....(.....Gram.)
Manufacturer, ...Laboratory No.....Expires.....
Patient, ...Address, ...
Date of use, ...
Physician's signature, ...
Address, ...
Dispensary No. .....
(Place.) (County.)

This slip must be forwarded by Physician in charge of Dispensary to the Department of Health immediately after product has been used.

SAMUEL G. DIXON, Commissioner.

If he have used the Suspension he reports that on Form 502 which differs from Form 501 only in the substitution of the words "Suspension Dead Tubercle Bacilli" for "Tubercle Bacilli Extract." These slips serve as checks in the use of the products and for the information of the Division of Distribution. The clinical report is made to the Division for the control of Tuberculosis.

When the preparation of these products of the tubercle bacilli was begun in the Laboratories of the Department, the Form 501 and 502 were slightly changed by the substitution of "Prepared by Laboratories of the Penna. Dept. of Health" for "Manufacturer" where it appears in the slip reproduced above.

The following statement shows the number of patients treated in this manner at the Sanatorium at Mont Alto, the Sanatorium at Cresson, and the Dispensaries named from the beginning of the distribution

and use of Tubercle Bacilli Products from June 29th, 1909 to December 31st, 1913, by years, giving the number of patients treated during periods mentioned with the locations of Dispensaries.

Place.	Dispensary number.	Number Patients Treated.					Totals.
		1909.	1910.	1911.	1912.	1913.	
Mont Alto,	Special	91	334	425	350	305	1,495
Cresson,	831	0	0	0	0	358	358
Wilkes-Barre,	1	5	19	37	95	96	252
York,	2	0	1	0	2	1	4
Carlisle,	4	0	0	0	2	3	5
Lebanon,	5	7	12	2	0	0	21
Emporium,	8	1	4	1	0	0	6
Johnstown,	9	6	5	1	0	0	12
Lewistown,	10	1	1	0	0	0	2
Chambersburg,	11	0	2	0	0	0	2
Chester,	12	6	2	0	4	3	15
Harrisburg,	13	7	11	10	16	20	64
Altoona,	14	0	1	1	0	18	20
Butler,	15	0	17	41	24	45	127
Berwick,	16	0	0	2	0	0	2
Milford,	19	0	0	0	1	1	2
Pittsburgh,	20	10	21	4	23	38	96
Philadelphia,	21	4	11	8	0	30	53
Rochester,	23	0	1	3	2	3	9
New Bloomfield,	25	0	0	0	0	2	2
Mifflintown,	26	0	0	0	5	5	10
Williamsport,	33	4	45	17	15	27	108
New Castle,	35	5	17	17	19	22	80
Sharon,	36	0	0	0	2	2	4
Reading,	37	0	0	0	12	17	29
Lancaster,	39	10	36	26	12	14	98
Scranton,	40	0	0	0	3	2	5
Meadville,	41	2	3	1	0	0	6
Clarion,	43	0	0	1	2	1	4
Lock Haven,	46	2	0	0	0	0	2
Huntingdon,	47	2	9	5	4	7	27
Indiana,	48	0	0	0	4	4	8
Montrose,	49	0	0	0	7	4	11
Allentown,	51	0	1	3	3	2	9
Easton,	52	0	0	0	0	1	1
Shamokin,	53	0	0	0	0	14	14
Monongahela,	55	0	0	0	2	4	6
Gettysburg,	60	0	0	2	0	0	2
Everett,	61	2	1	0	0	0	3
Hazleton,	68	0	2	8	3	0	13
Hastings,	69	0	1	1	0	3	5
Mt. Carmel,	71	0	4	5	2	0	11
Franklin,	72	0	0	0	0	2	2
Tyrone,	79	0	0	5	12	9	26
Philipsburg,	80	5	9	6	4	12	36
McKeesport,	81	5	1	4	3	0	13
Shenandoah,	85	5	6	2	0	0	13
Hanover,	86	2	2	0	1	0	5
Bangor,	87	0	0	1	0	0	1
Titusville,	90	0	0	0	3	2	5
West Fairview,	96	0	0	0	1	1	2
Bethlehem,	98	0	2	1	3	6	12
Homestead,	100	0	0	1	0	0	1
Brookville,	102	0	0	0	3	8	11
Beaver Falls,	103	6	16	11	17	17	67
Philadelphia (Frankford),	107	5	2	0	4	5	16
Waynesboro,	108	5	5	6	3	4	23
Wilkinsburg,	109	0	1	2	8	4	15
Sunbury,	110	4	4	0	1	0	9
Tarentum,	111	8	6	3	4	4	25
Nanticoke,	113	0	0	0	2	2	4
Philadelphia,	931	0	0	0	0	9	9
		210	605	663	683	1,137	3,298

The following statements show the total number of packages of Extract and Suspension supplied by months and also the number of packages used by months during the year 1913.

TUBERCLE BACILLI PRODUCTS SUPPLIED IN 1913.

Months.	Packages of Extract Dilutions Nos. 1 to 20.	Packages of Suspension Dilutions Nos. 1 to 16.	Total Number of Packages.
January, ...	1,164	312	1,476
February, ...	1,539	83	1,622
March, ...	1,279	572	1,851
April, ...	709	148	857
May, ...	1,723	86	1,809
June, ...	1,348	255	1,603
July, ...	1,804	131	1,935
August, ...	764	205	969
September, ...	1,376	70	1,446
October, ...	2,516	162	2,678
November, ...	2,333	60	2,393
December, ...	3,226	779	4,005
Total, ...	19,781	2,863	22,644

TUBERCLE BACILLI PRODUCTS USED DURING 1913.

Months.	Packages of Extract Dilutions Nos. 1 to 20.	Packages of Suspension Dilutions Nos. 1 to 16.	Total Number of Packages.
January, ...	738	88	826
February, ...	688	74	762
March, ...	778	129	907
April, ...	774	104	878
May, ...	1,072	155	1,227
June, ...	947	119	1,066
July, ...	1,089	142	1,231
August, ...	1,179	78	1,257
September, ...	1,120	65	1,185
October, ...	1,403	82	1,485
November, ...	1,343	106	1,449
December, ...	1,555	121	1,676
Total, ...	12,686	1,263	13,949

The following statements show the number of packages Tubercle Bacilli Extract and Suspension Dead Tubercle Bacilli supplied the Mont Alto Sanatorium and used the re during the year 1913.

TUBERCLE BACILLI EXTRACT—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Dil. 19	Dil. 20	Total.
January, ...	175	100	100	60	30	40	12	0	0	0	0	12	0	0	12	12	8	4	4	4	373
March, ...	150	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	350
May, ...	0	0	100	100	100	100	100	50	50	50	50	25	25	25	25	25	25	25	25	25	900
June, ...	150	150	0	0	0	0	0	0	0	0	0	0	50	50	0	0	0	0	0	0	400
July, ...	200	200	200	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	750
August, ...	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200
September, ...	150	75	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	275
October, ...	150	75	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	275
November, ...	0	150	150	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	375
December, ...	400	300	0	0	40	25	20	15	10	10	10	10	10	10	10	0	0	0	0	0	870
Total, ...	1,475	1,350	650	385	170	165	132	65	60	60	35	47	85	85	47	37	33	29	29	29	4,968

TUBERCLE BACILLI EXTRACT—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Total.
January,	82	30	44	25	29	15	4	3	7	3	3	0	3	1	4	0	0	0	253
February,	87	26	16	19	34	15	14	2	1	3	5	2	0	4	1	2	0	0	231
March,	94	70	28	18	19	25	9	8	4	3	3	6	1	0	3	5	3	0	299
April,	84	13	40	24	8	6	6	8	5	4	0	5	6	0	0	0	3	0	212
May,	113	179	39	3	5	7	6	1	5	8	0	0	7	1	2	0	0	0	376
June,	64	46	95	14	0	5	10	8	1	4	2	0	0	2	3	2	0	0	256
July,	80	100	17	25	7	0	11	6	3	1	0	0	0	1	0	1	2	1	255
August,	139	117	66	6	23	0	4	4	5	6	0	0	0	0	0	0	0	1	371
September,	120	106	69	11	7	10	0	2	4	1	0	0	0	0	0	0	0	0	330
October,	72	103	87	38	2	12	4	1	3	1	0	0	0	0	0	0	0	0	323
November,	162	100	38	90	15	1	11	1	0	1	0	0	0	0	0	0	0	0	419
December,	81	106	58	32	30	9	0	10	1	4	0	0	0	0	0	0	0	0	331
Total,	1,178	996	597	305	179	105	79	54	39	39	13	13	17	9	13	10	8	2	3,656

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Total.
January,	60	40	30	20	8	4	4	166
March,	50	100	50	50	50	50	50	400
June,	100	100	0	0	0	0	0	200
August,	40	25	25	20	20	20	20	170
October,	50	0	0	0	0	0	0	50
December,	100	50	300	100	0	0	0	550
Total,	400	315	405	190	78	74	74	1,536

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Total.
January,	9	7	3	7	1	0	0	27
February,	1	10	3	2	4	1	0	21
March,	7	7	12	3	3	3	0	35
April,	11	6	4	5	0	2	0	28
May,	50	6	3	4	8	7	11	89
June,	33	29	8	0	0	0	0	70
July,	47	17	5	3	0	0	0	72
August,	4	3	3	3	1	0	0	14
September,	5	1	2	0	0	0	0	8
October,	16	7	1	1	0	0	0	25
November,	18	14	4	0	0	0	0	36
December,	4	4	0	1	0	0	0	9
Total,	205	111	48	29	17	13	11	434

The following statements show the number of packages Tubercle Bacilli Extract and Suspension Dead Tubercle Bacilli supplied the Cresson Sanatorium and used there during the year 1913.

TUBERCLE BACILLI EXTRACT—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Total.
February,	100	100	100	0	0	0	0	0	300
March,	100	100	100	200	200	200	0	0	900
June,	300	200	0	0	0	0	0	0	500
July,	100	200	0	0	0	0	0	0	300
August,	0	0	200	0	0	0	0	0	200
September,	200	0	0	0	0	0	25	25	250
October,	400	600	200	100	0	0	0	0	1,300
November,	200	200	400	200	200	200	0	0	1,400
December,	400	400	400	400	0	0	0	0	1,600
Total,	1,800	1,800	1,400	900	400	400	25	25	6,750

TUBERCLE BACILLI EXTRACT—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Total.
March,	59	0	0	0	0	0	0	0	59
April,	61	111	0	0	0	0	0	0	172
May,	71	65	90	8	0	0	0	0	234
June,	80	40	34	32	3	0	0	0	189
July,	129	113	22	25	25	3	0	0	317
August,	47	118	84	39	18	31	0	0	337
September,	79	32	63	62	7	16	3	0	262
October,	265	125	43	36	48	9	6	2	534
November,	66	239	65	32	6	20	11	3	442
December,	223	190	153	66	24	18	7	13	694
Total,	1,080	1,033	554	300	131	97	27	18	3,240

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Total.
December,	24	24	48
Total,	24	24	48

The following statements show the number of packages Tubercle Bacilli Extract and Suspension Dead Tubercle Bacilli supplied to the Dispensaries and used by them during the year 1913.

TUBERCLE BACILLI EXTRACT—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Dil. 19	Dil. 20	Total.
January, ...	95	82	44	75	48	34	34	26	32	15	14	14	23	15	8	9	0	0	0	5	573
February, ...	105	43	54	30	73	47	21	18	18	20	15	5	0	5	10	0	5	0	15	5	489
March, ...	74	85	33	45	25	22	10	5	5	5	0	5	11	11	10	5	4	4	0	0	359
April, ...	124	130	86	51	36	48	38	40	32	21	30	15	8	5	10	10	0	0	0	15	699
May, ...	87	42	77	42	42	43	51	52	20	20	15	20	20	16	16	10	0	0	0	0	573
June, ...	155	88	43	48	23	7	11	20	23	10	15	5	0	0	0	0	0	0	0	0	448
July, ...	124	143	102	71	49	42	10	25	47	17	14	21	25	10	8	11	5	5	0	0	729
August, ...	69	47	71	32	10	25	14	5	0	25	15	5	6	5	10	10	5	0	0	0	354
September, ...	92	77	99	112	76	32	17	5	5	20	25	5	0	10	10	0	11	5	0	0	601
October, ...	133	139	124	88	94	67	37	23	17	29	18	29	36	15	30	15	15	12	10	0	941
November, ...	85	88	44	60	26	37	37	25	15	0	15	16	5	0	0	20	5	0	0	5	483
December, ...	25	44	52	54	33	84	57	58	11	5	0	0	20	15	10	0	6	0	6	6	491
Total, ...	1,168	1,008	829	708	540	488	337	302	225	187	176	140	154	107	122	90	56	36	31	36	6,740

TUBERCLE BACILLI EXTRACT—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Dil. 19	Dil. 20	Total.
January, ...	91	56	64	60	51	22	33	22	17	8	1	11	13	6	2	7	1	7	5	5	482
February, ...	121	37	58	59	31	21	18	17	22	12	6	4	15	11	1	2	3	9	2	3	452
March, ...	77	69	35	49	46	22	13	17	22	22	10	5	3	10	7	0	1	2	4	3	417
April, ...	68	64	52	33	39	30	16	12	9	12	12	8	4	7	10	2	1	0	7	2	388
May, ...	104	59	58	40	23	46	30	13	8	23	14	10	8	3	7	10	0	0	4	2	462
June, ...	125	94	49	41	30	23	36	22	12	9	19	8	2	6	7	3	1	0	0	8	495
July, ...	115	107	63	39	33	20	13	34	17	7	17	13	6	2	10	7	2	0	0	5	509
August, ...	64	78	71	51	14	46	12	19	34	14	6	13	11	2	5	11	4	0	0	0	455
September, ...	100	69	82	60	52	21	9	13	17	25	11	8	10	15	3	6	5	4	0	0	510
October, ...	76	92	64	64	58	39	20	5	10	21	22	10	11	10	7	2	11	2	4	0	523
November, ...	66	71	57	48	41	44	34	13	4	15	13	14	11	8	11	5	4	5	1	0	465
December, ...	47	67	62	43	50	44	54	24	11	7	18	17	13	3	9	14	6	2	3	4	503
Total, ...	1,054	863	715	587	468	378	288	211	183	175	149	120	112	83	79	69	39	31	30	32	5,666

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Total.
January,	30	21	37	22	20	16	0	0	0	0	0	0	0	0	0	0	146
February,	16	16	6	25	5	5	0	5	0	0	0	0	0	5	0	0	83
March,	24	17	12	19	11	11	16	6	6	8	8	8	0	0	5	5	156
April,	25	22	8	4	14	15	15	7	12	10	0	0	0	0	0	0	132
May,	4	5	12	0	19	23	18	0	5	0	0	0	0	0	0	0	86
June,	5	0	15	14	5	0	0	10	0	0	6	0	0	0	0	0	55
July,	16	15	20	15	15	0	0	10	25	10	0	5	0	0	0	0	131
August,	0	5	0	5	15	0	0	0	0	10	0	0	0	0	0	0	35
September,	14	5	3	10	5	9	5	0	0	4	10	0	5	0	0	0	70
October,	5	0	9	31	11	21	15	5	0	0	5	5	5	0	0	0	112
November,	35	5	0	0	10	0	0	0	0	0	0	5	0	5	0	0	60
December,	16	55	31	5	15	9	10	20	10	0	0	0	5	5	0	0	181
Total,	190	166	153	150	145	109	79	63	58	42	29	23	15	15	5	5	1,247

SUSPENSION DEAD TUBERCLE EXTRACT—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Total.
January,	8	8	9	8	10	1	5	8	0	0	0	1	3	0	0	0	61
February,	10	2	9	6	7	4	3	8	0	0	0	0	2	2	0	0	53
March,	17	9	13	23	9	9	6	4	0	0	0	0	0	3	1	0	94
April,	13	13	7	5	12	8	6	3	7	2	0	0	0	0	0	0	76
May,	12	1	8	4	10	7	8	6	3	7	0	0	0	0	0	0	66
June,	4	9	10	6	1	5	3	7	0	1	3	0	0	0	0	0	49
July,	12	5	10	11	3	3	1	9	8	3	2	0	0	0	3	0	70
August,	8	11	9	6	7	2	0	0	9	3	0	5	0	0	0	4	64
September,	2	8	11	11	10	2	0	0	0	10	1	1	1	0	0	0	57
October,	5	1	9	14	6	7	2	0	0	2	7	0	4	0	0	0	57
November,	19	3	2	12	10	7	7	0	0	2	3	3	2	0	0	0	70
December,	36	12	7	13	9	7	9	7	0	0	0	5	4	3	0	0	112
Total,	146	82	104	119	94	62	50	52	27	30	16	15	16	8	4	4	829

The table below shows the number of packages of Tubercle Bacilli Products supplied to various physicians on the order of the Commissioner of Health, as well as the number used by them.

TUBERCLE BACILLI EXTRACT—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Dil. 19	Dil. 20	Total.
January, ...	5	5	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
February, ...	150	150	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	400
March, ...	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
April, ...	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
May, ...	125	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250
July, ...	0	5	10	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
August, ...	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
September, ...	0	0	125	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250
November, ...	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
December, ...	0	0	0	5	130	130	5	5	0	0	0	0	0	0	0	0	0	0	0	0	265
Total, ...	311	316	241	141	145	145	6	6	1	1	1	1	1	1	1	1	1	1	1	1	1,323

TUBERCLE BACILLI EXTRACT—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Total.
January,	3	0	0	0	0	0	0	3
February,	2	2	0	0	0	1	0	5
March,	0	3	0	0	0	0	0	3
April,	2	0	0	0	0	0	0	2
June,	3	4	0	0	0	0	0	7
July,	5	3	0	0	0	0	0	8
August,	3	9	4	0	0	0	0	16
September,	1	5	10	2	0	0	0	18
October,	4	3	4	6	1	0	0	18
November,	3	5	1	6	2	0	0	17
December,	2	8	4	8	1	3	1	27
Total,	28	42	23	22	4	4	1	124

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Total.
March,	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
April,	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
Total,	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	32

The following statements give the total number of packages of Tubercle Bacilli Extract and Suspension Dead Tubercle Bacilli supplied by the Laboratories of the Department and the total number of packages used at the Cresson and Mont Alto Sanatoria, the Dispensaries and by special order of the Commissioner.

TUBERCLE BACILLI EXTRACT—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Dil. 19	Dil. 20	Total.
Cresson,	1,800	1,800	1,400	900	400	400	25	25	0	0	0	0	0	0	0	0	0	0	0	0	6,750
Mont Alto,	1,475	1,350	650	285	170	165	132	65	60	60	35	47	85	85	47	37	33	29	29	29	4,968
Dispensaries,	1,168	1,008	829	708	540	488	337	302	225	187	176	140	154	107	122	90	56	36	31	36	6,740
Special,	311	316	241	141	145	145	6	6	1	1	1	1	1	1	1	1	1	1	1	1	1,323
Total,	4,754	4,474	3,120	2,134	1,255	1,198	500	398	286	248	212	188	240	193	170	128	90	66	61	66	19,781

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES SUPPLIED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Total.
Cresson,	24	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
Mont Alto,	400	315	405	190	78	74	74	0	0	0	0	0	0	0	0	0	1,536
Dispensaries,	190	166	153	150	145	109	79	63	58	42	29	23	15	15	5	5	1,247
Special,	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	32
Total,	616	507	560	342	225	185	155	65	60	44	31	25	17	17	7	7	2,863

TUBERCLE BACILLI EXTRACT—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Dil. 17	Dil. 18	Dil. 19	Dil. 20	Total.
Cresson,	1,080	1,033	554	300	131	97	27	18	0	0	0	0	0	0	0	0	0	0	0	0	3,240
Mont Alto,	1,178	996	597	305	179	105	79	54	39	39	13	13	17	9	13	10	8	2	0	0	3,656
Dispensaries,	1,054	863	715	587	468	378	288	211	183	175	149	120	112	83	79	69	39	31	30	32	5,666
Special,	28	42	23	22	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	124
Total,	3,340	2,934	1,889	1,214	782	584	395	283	222	214	162	133	129	92	92	79	47	33	30	32	12,686

SUSPENSION DEAD TUBERCLE BACILLI—PACKAGES USED.

1913.	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6	Dil. 7	Dil. 8	Dil. 9	Dil. 10	Dil. 11	Dil. 12	Dil. 13	Dil. 14	Dil. 15	Dil. 16	Total.
Cresson,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mont Alto,	205	111	48	29	17	13	11	0	0	0	0	0	0	0	0	0	434
Dispensaries,	146	82	104	119	94	62	50	52	27	30	16	15	16	8	4	4	829
Special,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total,	351	193	152	148	111	75	61	52	27	30	16	15	16	8	4	4	1,263

VACCINE AND VACCINE SUPPLIES.

The free distribution of Vaccine and Vaccine Supplies is made by the Department of Health through the Division of Distribution of Biological Products when requisition is made, upon the recommendation of County Medical Inspectors—for the poor in townships not of the first-class and to poor charitable Institutions when asked for during a local or general epidemic of small-pox—or otherwise as ordered by the Commissioner of Health in extreme cases. Vaccine is also furnished to the State Sanatoria and Tuberculosis Dispensaries.

Under the urgency of a serious epidemic, however, the stringency of this rule may be relaxed, the safety of the people being of vastly more importance than economy of administration.

During the year 1913 there were reported 798 cases of small-pox throughout the State.

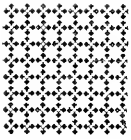
The following Table shows the total number of cases of Small-pox; the number of Glycernized Vaccine Points supplied; the number of tubes Vaccine Lymph supplied, and the cost of furnishing Vaccine Supplies for the years 1906-1913.

SUMMARY 1906-1913.

Years.	Number of cases small pox.	Number of vaccine points.	Number of tubes of lymph.	Cost.
1906,	73	1,610	110	$68 47
1907,	62	1,070	390	42 83
1908,	77	770	390	45 23
1909,	45	990	110	45 56
1910,	168	446	1,820	148 59
1911,	159	2,843	100	191 29
1912,	501	4,661	100	266 63
1913,	798	6,734	40	347 95
Total,	1,883	19,224	3,050	$1,157 55

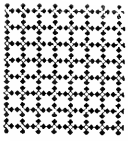
The following statement shows the total cost of vaccine, the credits received for unused vaccine returned and net cost for each month from Jan. 1, 1913 to December 31, 1913, with totals for the year.

Month.	Total Cost.	Credits.	Net Cost.
January,	$33 80	$13 98	$19 82
February,	29 26	12 49	16 77
March,	58 18	52	57 66
April,	59 94	6 31	53 63
May,	12 03	1 24	10 79
June,	44 54	15 15	29 39
July,	29 58	16 91	12 67
August,	28 29	9 56	18 73
September,	47 60	2 74	44 86
October,	39 01	9 63	29 38
November,	40 30	3 34	36 96
December,	19 18	1 89	17 29
Totals,	$441 71	$93 76	$347 95



DIVISION OF SANITARY ENGINEERING.

F. HERBERT SNOW, *Chief Engineer.*



DIVISION OF SANITARY ENGINEERING.

CONTENTS.

DIVISION OF SANITARY ENGINEERING.

The following is a detailed statement of the work carried on by the Division of Engineering of the State Department of Health during the year 1913, being the Eighth Annual Report of the Division made since the creation of the Department of Health.

I. ORGANIZATION AND ADMINISTRATION.

Throughout the past year the operation of the Division has been conducted along the same lines and with a force organized under several subdivisions as set forth in previous annual reports.

1. REGULAR FORCE.

On December 31st, 1913, the regular force in the Division of Engineering consisted of one chief engineer, sixteen assistant engineers, three engineering assistants, eight draughtsmen, ten clerks, twelve stenographers, and fifty-five sanitary inspectors. A full list of these officials together with the names of all other persons who at any time in the year belonged to the regular force of the Division may be found in that part of the general report of the Commissioner of Health which treats of the organization of the Department. It will be observed that relatively few changes in important positions occurred during the year. Special activities of the staff are noted in connection with the epidemics and in other exceptional work undertaken by the Division.

2. LOCAL HEALTH OFFICERS.

To facilitate the efficient administration of the work of the Department throughout the second class townships of the Commonwealth, 1,500 and over, wherein reside over two and a third million of persons entirely without sanitary protection such as should be afforded by the Boards of Health of first class townships and boroughs of Pennsylvania, the Commissioner of Health, in the year 1907, had the State—sixty-six counties, excluding Philadelphia,—divided into 733 sanitary districts, for each of which he appointed a Health Officer or resident sanitary agent.

In this division, so far as practicable, township boundaries were followed. Usually a district comprises two or more townships, including the boroughs and cities therein. For instance, Logan Township, Blair County, including with it Altoona City and Juniata borough, comprises a district.

The resident sanitary agent of the Commissioner of Health, in so far as his duties relate to the Medical Division of the Department, is confined to the territory wholly without the borough, city, and first class township because these municipalities are required by law to have their own organized boards of health; but everywhere within his district, regardless of the municipal boundaries, the resident sanitary agent may be directed to investigate stream pollutions, water works, and sewers; to render assistance to field officers; and to report to the chief of the Division of Engineering.

Such work performed for the Division of Engineering of the Department appears elsewhere in this report.

II. OFFICE WORK.

The general office work necessary to carry on the operations of the Division, including general correspondence, recording corporation reports and plans required by law to be filed in the office of the Department or in compliance with decrees of the Commissioner, attention to petitions and complaints, issuing of orders for the abatement of nuisances and menaces and preparation of plans of watersheds for the use of sanitary inspectors in the field, comprises the subjects treated of in this part of the report under the head of office work. More or less office work is performed in connection with the subdivisions of the organization and it is mentioned elsewhere.

3. CORPORATION REPORTS.

Under the provisions of Law No. 182 of the Acts of the Assembly of Pennsylvania, approved April 22nd, 1905, entitled "An Act to preserve the Purity of the Waters of the State, for the Protection of the Public Health," it is the duty of every municipal corporation, private corporation, company, and individual supplying or authorized to supply water to the public within the State to file with the Commissioner of Health a certified copy of the plans and surveys of the water works, with a description of the source from which the supply of water is derived.

Under the provisions of the same law, it is the duty of the public authorities having by law charge of the sewer system of any municipality in the State to file with the Commissioner of Health a report of such a sewer system which shall comprise such facts and information as the Commissioner of Health may require.

Thirteen such reports were received. Four of these were from municipal corporations and nine were from private corporations.

The municipal returns comprised three water supply reports and one sewerage report.

The private corporation reports pertained to nine water works systems.

The Department has now on file information obtained in this formal way relative to water supply in eight hundred and ninety-two places and relative to sewerage in four hundred and fifty-nine places.

These are the initial reports submitted with respect to water works and sewerage systems in operation at the time of the creation of the Department and are exclusive of the reports submitted with applications for permits from the Commissioner of Health, which permits must be obtained before old systems can be legally extended or new ones installed. These applications are mentioned elsewhere in this report.

4. RECORDED PLANS.

On December 31st., 1913, there were 15,491 plans officially registered in the Department, 2,196 having been added during the year; and of the grand total 5,319 accompanied water works and sewerage reports, of which 500 were added during the year; 6,629 accompanied water works and sewerage applications, of which 1,111 were added during the year; and 3,543 were of a miscellaneous character, including some of the office working maps and those used in field engineering and inspection work, of which 585 were added during the year.

5. PETITIONS AND COMPLAINTS.

The Commissioner of Health, in addition to the powers conferred by the new law, has all the powers conferred and must perform all the duties heretofore imposed by law upon the former State Board of Health, or any member, committee, or officer thereof, including the Secretary. The work of supervising the general interests of the health and lives of the citizens of the Commonwealth has been done in part in answer to petitions and complaints and requests for advice. The Commissioner's instructions to give prompt attention to petitions, complaints, and requests have been complied with in so far as the Department's force made it possible.

Hundreds of communications relative to stream pollutions by sewage or by industrial waste, or with respect to unsanitary conditions, inferior water supply or ice supply, and respecting sewers, sewage disposal, water supply, and general sanitation have received attention.

Six hundred and ninety-nine complaints and petitions have been acted upon during the year. Six hundred and eighty-five of these cases have been satisfactorily settled.

Twenty-eight requests for advice relative to sewage, waste water, garbage, night soil and dead animal disposal, and the location and construction of cesspools, privy vaults, and pig pens, have been answered.

Common nuisances located within the territory of municipalities having organized boards of health and made the subjects of complaints to the Commissioner of Health, have been referred by the Department to such local boards. There have been two hundred and ninety-eight references of this kind during the year; and at the close of the year all but nine of these cases have been reported by the various boards of health as being abated.

The places directly concerned with these petitions and complaints are the following:

Stream Pollution:—Albion, Bangor, Bryn Mawr, Cambridge Springs, Duncannon, Greensburg, Hanover, Haysville, Indiana (2), Lykens, Marietta, Muncy, Pottstown, Ridley Township (Delaware Co.) Sharpsville (2), South Bethlehem (Northampton Co.), Sugar Notch, Uniontown, Unionville, West Fairview. (22).

Sewage in Street Gutters:—Adamsburg, Altoona, Apollo, Arnold Avoca, Blairsville, Brockwayville, Carlisle, Crum Lynne, Dale, Duryea, Elizabethtown, Everett, Gordon, Greenville, Hatboro, Hyndman, Ingram, Johnstown, Latrobe, Lebanon, Miners Mills, Minersville, Morton, Mt. Wolf, New Holland, New Oxford, Oakland, Penn Township (Allegheny County), Philadelphia, Plymouth, Port Carbon, Pottstown, Punxsutawney, Ridley Township (Delaware County), Rimersburg, Rockledge, Royalton, Royersford, Rutledge, Schuylkill Haven, Spangler, Wellsboro, Wilkes-Barre, Womelsdorf. (45).

Defective Sewers:—Altoona, Dravosburg, DuBois, Glassport (2), Meyersdale, Mifflin Township (Allegheny County), Mt. Pleasant, Pitcairn, Point Marion, Renovo, Scranton, Spangler, Uniontown, Windber, York. (16).

Open Sewers:—Barnesboro, Duquesne, Pittston, York. (4).

Unsanitary Premises:—Abington Township (Montgomery County), Albion, Ambler, Ashland, Bellefonte, Bellevue (3), Bendersville, Berwick, Bethlehem, Bloomsburg (3), Boyertown, Brockwayville, Brownsville, Burnside, Camp Hill, Canonsburg, Carlisle (2), Centerville, Chester, Coal Township (Northumberland County), Coatesville (3), Collingdale (3), Colwyn (2), Confluence (2), Copley, Dallas, Danville, Darby (3), Darby Township (Delaware County) (2), Dawson, Duncannon, East Lansdowne, East Stroudsburg (2), Elizabethville, Erie, Fayette City, Franklin, Freedom, Freeport, Galeton, Gettysburg, Green Castle, Greenville, Harrisburg, Herndon, Homestead, Huntingdon, Ingram, Jamestown, Jersey Shore, Johnsonburg, Juniata, Kingston (2), Lebanon, Leechburg, Lewisburg, Lititz, Lower Merion Township (Montgomery County), Lumber City, Lykens (2), McKees Rocks, Middletown, Millersburg, Milton, Monongahela, Nazareth, New Castle, New Paris, Newport, Nicholson, Norristown, Northampton (2), North Belle Vernon, North Braddock (2), Olyphant, Osceola Mills, Patton, Paxtang, Pen Argyl, Penn Township

(Allegheny County), Perkasie, Philadelphia, Philipsburg, Pittsburgh, Port Alleghany, Pottsville, Radnor Township (Delaware County), Reading, Renovo (2), Ridley Township (Delaware County), Roaring Springs, Scott Township (Allegheny County), Scranton, Selinsgrove, Sellersville, Shillington (2), Shippensburg, Slippery Rock, South Bethlehem (Northampton County) (2), Speers, Spring Garden, State College, Steelton, St. Marys, Sunbury, Swatara Township (Dauphin County) (2), Tamaqua (3), Tarentum, Towanda, Tremont, Tullytown, Turtle Creek, Union City, Upper Darby, Vanderbilt, Vandergrift Heights, Verona, Wallaceton, Watsontown, Wattsburg, Waynesboro, Wellsboro, Wesleyville, West Brownsville, West Chester, West Elizabeth, West Newton, West Manayunk, West View, Wyomissing, York. (156).

Dumping Grounds:—Abington Township (Montgomery County), Camp Hill, Carmichaels, Chester, Collingdale (2), Curwensville (2), Donora, Glenside, Indiana, Johnstown, Lebanon, Mifflintown, Mt. Penn, New Bethlehem, New Cumberland, Oakmont, Paxtang, Philadelphia, Pittsburgh (2), Port Carbon, Pottstown, Scottdale (2), Sharpsburg, Spangler (2), Spring City, Sunbury, West Homestead, Wilkins Township (Allegheny County), Windber, York Haven. (35).

Dead Animals:—Canton and Washington. (2).

Swamp Land and Stagnant Water:—Altoona, Bellevue, Chartiers Township (Allegheny County), Connellsville, Corry, DuBoistown, East Stroudsburg, Jamestown, Luzerne, Media, Quakertown, Shenandoah, Shickshinny, Springdale, Trappe, Warren. (16).

Impure Water Supply:—Indiana and Seven Valleys. (2).

Three hundred and seventy-three complaints and petitions were made the subject of special investigation and report by the Engineering Division of which three hundred and sixty-eight have been abated. Thirty-five of these commanded the services of engineers, field inspectors and County Medical Officers and three hundred and thirty-eight commanded the services of the local health officers. Classified, these subjects were as follows:

Nuisances in streams by sewage and industrial wastes,	61
Impure water and ice supplies,	33
Garbage and night soil dumps,	39
Unsanitary premises,	156
Nuisances in street gutters by sewage,	28
Dead animals,	45
Swamp land and stagnant water,	11
	373

The localities of the cases investigated are shown in the following statement:

Nuisances in Streams by Sewage and Industrial Wastes:—In *Allegheny County*, Sewickley Heights Township; in *Armstrong County*, Gilpin Township; in *Berks County*, Cumru Township, Hyde Park, and Muhlenburg Township; in *Blair County*, Blair Township; in

Bradford County, Monroe Township; in *Bucks County,* Newtown and Plumstead Township; in *Butler County,* Evansburg and Mars; in *Cameron County,* Shippen Township and Sizerville; in *Carbon County,* Nesquehoning; in *Chester County,* Devon; in *Clearfield County,* Bells Landing; in *Clinton County,* Crawford Township; in *Crawford County,* Randolph Township, Richmond Township, and Steuben Township; in *Delaware County,* Radnor Township and Springfield Township; in *Elk County,* Fox Township; in *Fayette County,* Fairchance; in *Franklin County,* Greene Township and Guilford Township; in *Jefferson County,* Heathville; in *Juniata County,* McAllisterville and Walker Township; in *Lackawanna County,* South Abington Township; in *Lancaster County,* Salisbury Township and Upper Leacock Township; in *Lebanon County,* North Lebanon Township; in *Luzerne County,* Albert and Dallas; in *McKean County,* Bradford Township and Port Alleghany; in *Mercer County,* Grove City; in *Monroe County,* Chestnut Hill Township and Delaware Water Gap; in *Montgomery County,* Merion, Norristown, and Trooper; in *Northampton County,* Lehigh Township, Washington Township, and Upper Nazareth Township (2); in *Perry County,* Penn Township and Perdix; in *Schuylkill County,* Ferndale; in *Somerset County,* Summit Township; in *Tioga County,* Tioga; in *Warren County,* Brokenstraw Township; in *Washington County,* Allen Township; in *Wayne County,* Damascus Township and Seeleyville; in *Westmoreland County,* Millwood; in *Wyoming County,* Lake Cary, Lake Winola, and Overfield Township; in *York County,* Lower Chanceford Township. (61).

Impure Water and Ice Supply:—In *Armstrong County,* Apollo; in *Bedford County,* Waterside; in *Berks County,* Lyons Station, Mt. Penn, and North Heidelberg Township; in *Bucks County,* Springfield Township; in *Cambria County,* Blandburg; in *Chester County,* Schuylkill Township; in *Clearfield County,* Berwindale; in *Clinton County,* Booneville and Green Township; in *Cumberland County,* East Pennsboro Township and South Middleton Township; in *Dauphin County,* Susquehanna Township; in *Fayette County,* Braznell; *in Lancaster County,* Caernarvon Township and Florin; in *Lawrence County,* Wayne Township; in *Lebanon County,* Myerstown and South Annville Township; in *Luzerne County,* Sugar Notch; in *McKean County,* Port Allegany; in *Montgomery County,* Perkiomen Township and Skippack Township; in *Northampton County,* Bangor; in *Potter County,* Bingham Township and Ulysses Township; in *Snyder County,* McClure; in *Susquehanna County,* Dimock; in *Tioga County,* Potterbrook; in *Union County,* Allenwood; in *Westmoreland County,* Lower Burrell Township; in *York County,* West Manchester Township. (33).

Garbage and Night Soil Dumps:—In *Allegheny County,* Creighton, East Deer Township, Moon Township, Ohio Township, Patton Township (3), Plum Township, and Ross Township; in *Beaver County,* Homewood; in *Berks County,* Spring Township; in *Chester County,* East Bradford Township (2), North Coventry Township, and Valley Township; in *Crawford County,* Vernon Township; in *Cumberland County,* East Pennsboro Township; in *Dauphin County,* Susquehanna Township; in *Delaware County,* Felton Station; in *Elk County,* Brockport and Kersey; in *Fayette County,* Connellsville Township; in *Juniata County,* Fermanagh Township; in *Lawrence County,* Union Township (2); in *Lebanon County,* North Cornwall Township and North Lebanon Township; in *Mercer County,* Hickory Township and Sharon; in *Northampton County,* Palmer Township (2); in *Perry County,* Oliver Township; in *Sullivan County,* Mildred; in *Venango County,* Cranberry Township; in *Washington County,* Fallowfield Township; in *Westmoreland County,* Rostraver Township; in *York County,* Fairview Township, Spring Garden Township, and West Manchester Township. (39.)

Unsanitary Premises:—In *Adams County,* McKnightstown; in *Allegheny County,* Creighton, East Deer Township, Findley Township, Hites, Keown, North Braddock, Patton Township, Robinson Township, and Shaler Township; in *Armstrong County,* Gilpin Township (2); in *Beaver County,* North Sewickley Township and Rochester Township; in *Bedford County,* Bedford Township; in *Berks County,* Geigers Mills, Leesport, Lower Alsace Township, Oakbrook, Penn Township, and Reading; in *Blair County,* Altoona, Lakemont Terrace, Logan Township, and Snyder Township; in *Bradford County,* Rummerfield and Wyalusing Township; in *Bucks County,* Buckingham Township, East Rockhill Township, Penns Park, and Plumsteadville; in *Butler County,* Callery, North Washington, and Slippery Rock Township; in *Cambria County,* Glasgow and Lloydell; in *Centre County,* Boalsburg; in *Chester County,* Berwyn (3), Devon, East Fallowfield Township (2), Easttown Township, Paoli, Strafford, Tredyffrin Township, and Valley Township; in *Clarion County,* Huefner; in *Clearfield County,* Allport, Burnside Township, Karthaus Township, and Sandy Township; in *Columbia County,* Bloomsburg; in *Crawford County,* Summit Township; in *Cumberland County,* East Pennsboro Township, Enola, and Lower Allen Township (2); in *Dauphin County,* Susquehanna Township (3), Swatara Township, and Wiconisco Township; in *Delaware County,* Glen Mills and Thornbury Township; in *Erie County,* North East Township, North Girard, and West Springfield (2); in *Fayette County,* Connellsville Township, Kifertown, North Union Township, and Washington Township; in *Huntingdon County,* Melrose; in *Indiana County,* Centre Township, Conemaugh Township (2), Penn Run, and

Pine Township; in *Lackawanna County,* Childs and Thornhurst; in *Lancaster County,* Bainbridge, Lancaster Township, and Millersville; in *Lawrence County,* Union Township; in *Lebanon County,* Avon, Fredericksburg, Lawn, and Palmyra (3); in *Lehigh County,* Emerald; in *Luzerne County,* Dupont (2), Fairmount Township, Pittston Township, Sebastopol, and West Nanticoke; in *Lycoming County,* Loyalsock Township (6), and Trout Run; in *Mercer County,* Hickory Township and Pymatuming Township; in *Monroe County,* Bartonville, Chestnut Hill Township, and Tobyhanna; in *Montgomery County,* Fitzwatertown and Upper Dublin Township; in *Northampton County,* Bethlehem Township, Cherry Hill, Danielsvile, and Lower Saucon Township; in *Perry County,* Sterrett Gap; in *Schuylkill County,* Butler Township, Girardville, Lost Creek, Mahanoy Planes, Nuremberg, Pine Grove Township, Porter Township, and West Mahanoy Township; in *Snyder County,* Franklin Township; in *Sullivan County,* Forks Township; in *Tioga County,* Knoxville; in *Union County,* Glen Iron; in *Venango County,* Clinton Township; in *Warren County,* Sheffield Township and Warren; in *Washington County,* Buffalo Township, Canton Township (2), East Pike Run Township, and North Franklin Township; in *Wayne County,* Palmyra Township (2), and Texas Township; in *Westmoreland County,* Allegheny Township (2), Arona, Derry Township, Hempfield Township, Herminie, Lower Burrell Township, Penn Township (3), and Rostraver Township (2); in *York County,* Fairview Township, Newberry Township, and Spring Garden Township. (156).

Nuisances in Street Gutters by Sewage:—In *Allegheny County,* Bethel Township and Hoboken; in *Beaver County,* North Sewickley Township; in *Berks County,* Amityville; in *Bucks County,* Bristol Township and Doylestown Township; in *Carbon County,* Nesquehoning; in *Columbia County,* Rupert; in *Dauphin County,* Derry Church, Lucknow, and Wiconisco Township; in *Delaware County,* Cheyney; in *Fayette County,* East Liberty and Upper Tyrone Township; in *Lancaster County,* Blue Ball; in *Lawrence County,* Union Township; in *Lebanon County,* Annville; in *Montgomery County,* Huntingdon Valley, Jeffersonville, and Plymouth Township; in *Schuylkill County,* Pine Grove Township and William Penn; in *Snyder County,* Beavertown; in *Warren County,* Sheffield; in *Wayne County,* Texas Township; in *Westmoreland County,* Allegheny Township and Livermore; in *York County,* Mt. Top. (28).

Dead Animals:—In *Allegheny County,* Findley Township; in *Armstrong County,* Leechburg and Madison Township; in *Bedford County,* Hopewell Township and Maria; in *Bradford County,* Springfield Township; in *Cambria County,* Nant-y-Glo; in *Carbon County,* Lehigh Gap; in *Centre County,* Rush Township; in *Chester County,* Willistown Township; in *Clearfield County,* Brady Township; in *Columbia*

County, Aristes; in *Dauphin County,* Lower Swatara Township and Susquehanna Township (2); in *Erie County,* Amity Township; in *Jefferson County,* Snyder Township; in *Juniata County,* Fermanagh Township; in *Lancaster County,* Mastersonville and Pequea Township; in *Lawrence County,* Slippery Rock Township; in *Lebanon County,* Palmyra and South Annville Township; in *Lehigh County,* Upper Saucon Township and Washington Township; in *Luzerne County,* Alderson (2) and Foster Township; in *Lycoming County,* Cogan House Township and Roaring Branch; in *McKean County,* Bradford Township; in *Monroe County,* Hamilton Township and Stroud Township; in *Montour County,* Mayberry Township (2); in *Snyder County,* Beaver Springs (2); in *Tioga County,* Chatham Township, and Union Township; in *Union County,* East Buffalo Township; in *Venango County,* Oil Creek Township; in *Washington County,* Buffalo Township and Hackett; in *Wyoming County,* Mehoopany; in *York County,* Newberry Township. (45).

Swamp Land and Stagnant Water:—In *Fayette County,* North Union Township; in *Lancaster County,* Manheim Township; in *Lebanon County,* North Lebanon Township; in *Luzerne County,* West Nanticoke; in *Lycoming County,* Loyalsock Township; in *Monroe County,* Mt. Pocono; in *Northumberland County,* Point Township; in *Somerset County,* Summit Township; in *Westmoreland County,* East Huntingdon Township and Jacksonville; in *York County,* West Manchester Township. (11).

6. ORDERS OF ABATEMENT.

To do away with possible causes of disease and mortality in the way of public menaces and nuisances, more especially outside of the boroughs and cities and within the watersheds of streams drawn upon for water supplies, the Commissioner of Health has the power and authority to order such nuisances and menaces to be abated and removed. Upon examination made by any persons duly authorized by the Commissioner of Health so to do, information as to the facts is submitted to this office and thereupon an order to abate may be issued. These orders are signed by the Commissioner of Health and served by the field or local health officers. Many hundreds of properties have been put in sanitary condition upon inspection and the verbal request of the field or local health officer, without resort to the issuing of a formal order of abatement.

Nine thousand and nineteen written orders have been prepared for issuance during the year. Except for twenty-eight, these notices have been made out as the result of inspections by field officers of the Department and have been for the abatement of nuisances polluting or menacing the purity of streams from which public water supplies are drawn. The twenty-eight orders referred to have been for

the abatement of unsanitary conditions in general, mostly reported by local health officers. A more detailed statement of these orders of abatement is given elsewhere in this report.

7. DRAUGHTING.

The work of the draughting room has continued as in preceding years and is carried out as part of the work of the Design and Construction Section of the Division of Engineering. It consists chiefly of map tracing and chart making for the various divisions of the Department as well as work on the design and construction of water works, sewerage systems and miscellaneous engineering work at the State sanatoria. As in 1912 the work of compiling township atlases of the various counties in the State was continued, making use of material furnished by atlases, the U. S. Geological Survey sheets and the reports of the field inspectors. Besides this regular work, county, township, borough, and village maps were made for use of the field inspectors and for the Medical Division and the Division of Distribution of Biological supplies.

The work of the draughtsmen is shown in the following table according to the proportional part of the time of the entire draughting force:

Field work in connection with designs and construction,	24%
Office work in connection with designs and construction,	12%
Division of Engineering, township maps, etc.,	52%
Other divisions, charts, tables, etc.,	12%
	100%

The maps, drawings and charts made during the year are as follows:

Borough maps for inspection work (drawn),	61
Borough maps for inspection work (revised),	11
Township maps, for inspection work (drawn),	203
Township maps, for inspection work (revised),	608
Miscellaneous maps and charts for Engineering Division,	89
Charts, tables, etc., for other divisions,	51
Total number,	1,023

The following table gives in detail the number of maps of various political divisions made for each county:

SUMMARY OF TOWNSHIP, BOROUGH AND VILLAGE MAPS MADE IN 1913.

County.	Townships.		Boroughs and Villages.	
	Drawn.	Revised.	Drawn.	Revised.
Adams,	3	34	6	0
Armstrong,	0	1	0	0
Beaver,	2	0	1	0
Bedford,	0	4	0	0
Berks,	0	3	0	0
Blair,	0	8	0	0
Bradford,	17	48	7	3
Bucks,	0	1	0	0
Butler,	0	3	0	0
Cambria,	2	10	1	1
Cameron,	5	4	0	0
Carbon,	0	2	0	0
Centre,	0	9	0	0
Chester,	0	1	0	0
Clarion,	0	2	0	0
Clearfield,	0	8	0	0
Clinton,	3	5	0	0
Columbia,	0	10	0	0
Crawford,	9	2	0	0
Cumberland,	4	7	0	0
Dauphin,	15	46	4	0
Delaware,	0	1	0	0
Elk,	0	6	0	0
Erie,	0	4	0	0
Fayette,	13	15	3	0
Forest,	4	1	0	0
Franklin,	6	4	1	0
Greene,	3	1	0	0
Indiana,	0	6	0	0
Jefferson,	0	16	1	0
Lackawanna,	0	5	0	0
Lancaster,	4	19	0	0
Lawrence,	2	1	0	0
Lehigh,	1	1	0	0
Luzerne,	1	32	1	3
Lycoming,	4	26	5	2
McKean,	1	17	0	0
Mercer,	6	6	0	0
Monroe,	3	20	4	0
Montgomery,	5	32	0	0
Northumberland,	0	4	0	0
Potter,	0	12	0	0
Schuylkill,	24	26	5	2
Snyder,	7	2	0	0
Somerset,	0	15	0	0
Sullivan,	8	7	0	0
Susquehanna,	15	6	9	0
Tioga,	3	21	8	0
Union,	0	1	0	0
Venango,	1	3	0	0
Warren,	24	18	2	0
Washington,	0	2	0	0
Wayne,	0	3	0	0
Westmoreland,	5	9	2	0
Wyoming,	2	8	0	0
York,	1	30	1	0
	203	608	61	11

III. ENGINEERING.

8. WATER WORKS AND SEWERAGE APPLICATIONS.

The review of plans of proposed sewerage and water works systems and of extension to existing systems, and the making of investigations and reports in relation thereto has been an important part of the work performed by the Enginering Division.

There were 252 sewerage and water works applications received by the Department and recorded during the year; 105 pertaining to water works and 147 pertaining to sewerage. Of the water works applications 31 were sent in by municipalities and 74 by private corporations. Of the sewerage applications 130 were made by municipalities and 17 by private corporations and individuals.

The water works applications may be classified as follows: twenty-six for ground water sources; ten for both ground and surface waters; and sixty-nine for surface water sources. In sixteen cases the applications provided for the purification by filtration of the surface water sources and in one case for the purification by filtration of a well water source. In nine cases the applications provide for chemical disinfection of the supplies, in two instances where the water was already being filtered. In seventeen instances the surface waters were being filtered at the time the applications for extensions were made, namely in the following cases:

WATER WORKS APPLICATIONS WHERE SUPPLY WAS BEING FILTERED.

1. Apollo Water Works Company.
2. Beaver Valley Water Company.
3. Bristol (First application).
4. Bristol (Second application).
5. Citizens Water Company of Canton (Mill Creek Supply).
6. Citizens Water Company of Washington.
7. Coatesville.
8. Danville.
9. Danville State Hospital for Insane.
10. Ellwood Water Company.
11. Huntingdon Water Supply Company.
12. Linn, Guy F.—Whitaker Borough (To secure supply from South Pittsburgh Water Company).
13. Moreland Spring Water Company.
14. Pittsburgh.
15. Punxsutawney Water Company.
16. South Strabane Water Company (To secure supply from Citizens Water Company of Washington).
17. York Water Company.

Numbers 7 and 11 were applications for filtration, the former being in connection with a proposed new source of supply and the latter for a modern filtration plant.

The applications for permits to supply water from new water filter plants are given below:

WATER WORKS APPLICATIONS PERTAINING TO PROPOSED FILTER PLANTS.

1. California Water Company.
2. Clear Springs Water Company.
3. Coatesville (New source).
4. Consolidation Coal Company—Jenner Township, Somerset County.
5. East Greenville.
6. Emlenton Water Company.
7. Greenville Water Company.
8. Haysville Water Company.
9. Hershey Water Company.
10. Huntingdon Water Supply Company.
11. Midland Water Company.
12. Muncy Water Supply Company.
13. Pittsburgh Coal Company—Rostraver Township, Westmoreland County.
14. Tarentum.
15. Troy.
16. Wrightsville Water Supply Company.
17. York County Consolidated Water Company.

Numbers 1, 3, 6, 10, and 12 were received at the close of the year and are pending.

The applications for approval of chemical disinfecting plants are as follows:

WATER WORKS APPLICATIONS PERTAINING TO CHEMICAL DISINFECTING PLANTS.

1. Bangor Water Company.
2. Bath.
3. Bristol.
4. Citizens Water Company of Canton (Lake Nephawin Supply).
5. Citizens Water Company of Canton (Mill Creek Supply).
6. Emlenton Water Company.
7. Homestead.
8. Nicholson Water Company.
9. Troy.

Number 6 was covered by letter granting approval subject to the plant being operated in a satisfactory manner. Numbers 1 and 2 were received at the close of the year and are pending. Numbers 3 and 5 concern existing filter plants.

The sewerage applications may be classified as follows: fifty-two for sanitary sewers to take sewage only, twelve of which were comprehensive studies; forty-two for combined sewers to receive both sewage and storm water; thirty-eight for sewage treatment works, eleven of which included comprehensive sewer systems; and fifteen for extension of time.

The applications for sewage treatment plants are given below:

APPLICATIONS FOR NEW SEWAGE TREATMENT PLANTS OR IMPROVEMENTS TO OLD PLANTS.

1. Altoona.
2. Beaver Falls (Tentative joint proposition).
3. Brackenridge.
4. Butler-Highfields Land & Improvement Company.
5. Canonsburg (Tentative Community proposition).
6. Clearfield.
7. Collier Land Company.
8. Edinboro and Northwestern State Normal School (First application).
9. Edinboro and Northwestern State Normal School (Second application).
10. Evansburg.
11. Farrell (Joint proposition with Sharon).
12. Greenville.
13. Hillside Home.
14. Jeannette.
15. Lansdale.
16. Ligonier.
17. Luzerne County Industrial School for Boys.
18. Meyersdale.
19. Middle Coal Field Poor District.
20. Mount Lebanon Township (First application).
21. Mount Lebanon Township (Second application).
22. Mount Lebanon Township (Third application).
23. Mount Pleasant.
24. Norristown.
25. North East.
26. Oakdale.
27. Philadelphia Hospital for Contagious Diseases.
28. Robinson, J. Catherwood, Estate, (First application).
29. Robinson, J. Catherwood, Estate, (Second application).
30. Schock, J. M., et al.
31. Seybert Institution.
32. Tarentum.
33. Union City (First application).
34. Union City (Second application).
35. Valley Forge Park Association.
36. Vesta Coal Company.
37. West Newton.
38. York.

Of the applications in the foregoing list nine have not been finally acted upon, namely, Numbers 3, 5, 6, 7, 17, 23, 26, 30 and 34. Three were taken up in letters addressed to the applicants by the Commissioner of Health discussing the designs submitted, namely, Numbers 27, 29 and 35; Number 28 was dismissed, and the second application acted upon.

The applications for comprehensive sewer systems are given below:

APPLICATIONS FOR COMPREHENSIVE SANITARY SEWER SYSTEMS.

1. Altoona.
2. Arnold.
3. Avalon.
4. Butler-Highfields Land & Improvement Company.
5. Carbondale.
6. Carrolltown.
7. Charleroi.
8. Clearfield.
9. Duquesne.
10. Edinboro and Northwestern State Normal School.
11. Edwardsville.
12. Evansburg.
13. Jeannette.
14. Keefer & Shipman.
15. Lansdale.
16. Latrobe.
17. Meyersdale.
18. Mt. Lebanon Township (First application).
19. Mt. Lebanon Township (Second application).
20. North Charleroi.
21. Oakdale.
22. Parkesburg.
23. Union City.

Of the applications in the foregoing list six have not been finally acted upon, namely, Numbers 3, 6, 8, 14, 16 and 21.

Places making applications for extension of time in which to fulfill the terms of the decrees issued by the Commissioner of Health and to continue the discharge of sewage into the waters of the State, are as follows:

SEWERAGE APPLICATIONS FOR EXTENSION OF TIME.

1. Bedford.
2. Bristol.
3. Coraopolis.
4. East McKeesport.
5. Hazleton.
6. Kane.
7. New Castle.
8. New Kensington.
9. Northumberland.
10. Sayre.
11. Shingle House.
12. Uniontown.
13. Warren (First application).
14. Warren (Second application).
15. Watsontown.

Of the applications in the foregoing list, Numbers 1, 2, 4, 6, 8, 9 and 12 have been acted upon, number 9 by letter, the others by formal decrees or permits. The remainder of the applications have not been definitely acted upon, pending the submission of evidence of progress and good faith on the part of the applicants to comply with the requirements of the decrees of the Department.

Of the 252 applications recorded during the year, 167 have been examined and reported upon, also one application left over from 1908, three from 1909, nine from 1911, and fifty from 1912, making a total of 230 applications investigated and reported upon during the year.

The applications of the following public and private corporations were dismissed or withdrawn: Millersburg Home Water Company, received in 1909; Indiana, received in 1911; Womelsdorf Consolidated Water Company and the Huntingdon Water Supply Company, received in 1912; and J. Catherwood Robinson Estate, received in 1913. A total of five dismissals.

The 175 permits issued during the year, 66 for water works and 109 for sewerage, include three water works and thirteen sewerage decrees not in response to applications. The other permits and decrees and ten less formal letters, five relative to water works and five relative to sewerage, embody the decisions, requirements and stipulations of the Department relative to the 80 water works and 150 sewerage applications acted upon. A more complete discussion and summary of the water works permits and sewerage permits will be found under their respective heads.

A summary of the water works and sewerage applications received and acted upon since the inauguration of the Department is given below:

SUMMARY OF APPLICATIONS RECEIVED AND ACTED UPON.

Applications received in 1905-06,	155
Applications received in 1907,	236
Applications received in 1908,	306
Applications received in 1909,	324
Applications received in 1910,	286
Applications received in 1911,	292
Applications received in 1912,	340
Applications received in 1913,	252
Total,	2,191

Applications acted upon in 1905-06,	74
Applications acted upon in 1907,	159
Applications acted upon in 1908,	266
Applications acted upon in 1909,	278
Applications acted upon in 1910,	282
Applications acted upon in 1911,	227
Applications acted upon in 1912,	303
Applications acted upon in 1913,	230
Total,	1,819

There were 302 applications pending at the end of 1913, seventy having been either dismissed or withdrawn. Of the 302 applications, 160 are for water works and 142 for sewerage and sewage treatment works. Of these, sixty of the water works applications and thirty-two of the applications relating to sewerage were investigated and reported upon leaving 210 to be investigated.

The 2,191 applications comprise 827 for water works and 1,364 for sewerage. Of the former 198 were for municipal and 629 for private plants, and of the latter 1,196 were for municipal and 168 for private works.

It may be interesting to note that 258 of the water works applications concerned ground sources, 27 both ground and surface, and 542 surface sources; further, that in 122 instances the surface waters were being filtered and that in 115 instances filtration was contemplated for surface waters and in one instance for ground waters. The applications as received by years are shown in the following table:

WATER WORKS APPLICATIONS.

Class of Application.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
Concerning surface sources, ...	23	47	75	97	79	55	97	69	542
Concerning ground and surface sources, ...	.....	.....	.....	.....	4	7	6	10	27
Concerning ground sources, ...	11	24	32	27	35	55	48	26	258
Total, ...	34	71	107	124	118	117	151	105	827
Where surface waters were being filtered, ...	1	6	26	23	12	4	33	17	122
Where filters were contemplated for surface waters, ...	2	11	11	12	20	20	23	16	115
Where filters were contemplated for ground waters, ...	.....	.....	.....	.....	.....	.....	.....	1	1
Total, ...	3	17	37	35	32	24	56	34	238

So it appears that in 238 instances plans for new water filter plants or plans for extensions to existing plants or the methods of operation have been carefully considered and passed upon, or will engage the attention of the Department at an early date.

On December 31st, 1913, there were 113 filter plants in operation or under construction for the purpose of supplying water to the public in Pennsylvania. These plants are given in the following table arranged alphabetically, according to the name of the water company where the system supplies numerous equally important places, and according to the name of the place supplied where the district is limited or according to the name of the metropolis where its suburbs are supplied:

WATER FILTER PLANTS IN USE OR BEING ERECTED.

1. Apollo, Apollo Water Works Company.
2. Beaver Valley Water Company, East Vale Plant.
3. Beaver Valley Water Company, New Brighton Plant.
4. Berwick, Berwick Water Company.
5. Bethlehem City Water Company, South Bethlehem and other towns near Bethlehem.
6. Bethlehem Steel Company.
7. Bloomsburg, Bloomsburg Water Company.
8. Bristol, Municipal Plant.
9. Brookville, Municipal Plant.
10. Butler, Butler Water Company.
11. Cambridge Springs, Municipal Plant.
12. Canonsburg, North Strabane Water Company.
13. Canton, Citizens Water Company (Mill Creek supply).
14. Carlisle, Carlisle Gas & Water Company.
15. Chester, New Chester Water Company.
16. Clarion, Clarion Water Company.
17. Clear Springs Water Company, Catasauqua, Northampton, Coplay, and vicinity.
18. Coatesville, Municipal Plant.
19. Columbia, Columbia Water Company.
20. Connellsville, Connellsville Water Company.
21. Danville, Municipal Plant.
22. Danville, Plant of the State Hospital for the Insane.
23. Eagles Mere, Eagles Mere Water Company.
24. East Greenville, Municipal Plant.
25. Elizabeth and neighboring towns, Monongahela Valley Water Company.
26. Ellwood City, Ellwood Water Company.
27. Enola, Dauphin Consolidated Water Company.
28. Erie City.
29. Ernest, Jefferson & Clearfield Coal & Iron Company.

30. Evitts Creek Water Company.
31. Falls Creek, Municipal Plant.
32. Franklin, Municipal Plant.
33. Freeport, Freeport Water Works Company.
34. Gettysburg, Gettysburg Water Company.
35. Harrisburg, Municipal Plant.
36. Haysville and Osborne, Haysville Water Company.
37. Hershey and vicinity, Hershey Water Company.
38. Holmesburg, Philadelphia & Bristol Water Company.
39. Hummelstown, Hummelstown Consolidated Water Company.
40. Huntingdon, Huntingdon Water Supply Company.
41. Huntingdon, Plant of the Pennsylvania Industrial Reformatory.
42. Indiana, Clymer Water Company of Indiana.
43. Iselin, Pittsburgh Gas Coal Company.
44. Jenkintown and vicinity, Moreland Spring Water Company.
45. Kensington Water Company, New Kensington and vicinity.
46. Kittanning, Armstrong Water Company.
47. Lancaster, Municipal Plant.
48. Latrobe, Latrobe Water Company.
49. Lebanon Valley Consolidated Water Company. Plant at Jonestown.
50. Marianna, Marianna Water Company.
51. Masontown, Municipal Plant.
52. McKeesport, Municipal Plant.
53. Mechanicsburg, Mechanicsburg Gas & Water Company.
54. Media, Municipal Plant.
55. Midland, Midland Water Company.
56. Middletown, Middletown & Swatara Consolidated Water Company.
57. Monongahela, Monongahela City Water Company.
58. Montgomery, Montgomery Water Company.
59. Morganza, Pennsylvania Training School.
60. Natrona, Natrona Water Company.
61. New Bethlehem, Citizens Water Company.
62. New Castle, City of New Castle Water Company.
63. New Oxford, Municipal Plant.
64. Newport, Newport Home Water Company.
65. Norristown, Norristown Insurance & Water Company.
66. North East, Municipal Plant.
67. Parker, Parker City Water Company.
68. Pennsylvania Water Company, Wilkinsburg and other Pittsburgh suburbs.
69. Perkasie, Perkasie Water Supply Company.
70. Philadelphia Municipal—Belmont Plant.
71. Philadelphia Municipal—Lower Roxborough Plant.
72. Philadelphia Municipal—Queen Lane Plant.
73. Philadelphia Municipal—Torresdale Plant.
74. Philadelphia Municipal—Upper Roxborough Plant.
75. Phoenixville, Municipal Plant.
76. Pittsburgh, Municipal Plant.
77. Pottstown, Pottstown Gas & Water Company.
78. Punxsutawney, Punxsutawney Water Company.
79. Quarryville, Quarryville Water Company.
80. Reading Municipal—Antietam Plant.
81. Reading Municipal—Bernhart Plant.
82. Reading Municipal—Egelman Plant.
83. Reading Municipal—Maiden Creek Plant.
84. Ridgway, Municipal Plant.
85. Riverton Consolidated Water Company, Lemoyne and other suburbs of Harrisburg.
86. Royersford and Spring City, Home Water Company.
87. St. Benedict, St. Benedict Water Company.
88. Sayre and Athens, Sayre Water Company.
89. Scranton, Scranton Gas & Water Company.
90. Sharon and Farrell (South Sharon), Sharon Water Company.
91. South Pittsburgh Water Company.
92. Springfield Consolidated Water Company, Neshaminy Creek Plant.
93. Springfield Water Company, Crum Creek Plant.
94. North Springfield Water Company, Pickering Creek Mechanical Plant.
95. North Springfield Water Company, Pickering Creek Slow Sand Plant.
96. Spring Grove, P. H. Gladfelter Company.
97. Steelton, Municipal Plant.
98. Sunbury, Sunbury Water Company.
99. Tarentum, Municipal Plant.
100. Tarentum and Brackenridge, Allegheny Valley Water Company.
101. Tri-Cities Water Company, Charleroi, Monessen, and Donora.
102. Vandergrift Water Company, Vandergrift and neighboring boroughs.
103. Washington, Citizens Water Company of Washington.
104. Warren, Warren Water Company.

105. Waynesburg, Waynesburg Water Company.
106. Wernersville, Plant of State Asylum for Chronic Insane.
107. West Conshohocken, West Conshohocken Water Company.
108. West Pittsburgh, West Pittsburgh Water Company.
109. West Reading, West Reading Water Company.
110. Wilkes-Barre, Spring Brook Water Supply Company, Crystal Lake Plant.
111. Wilkes-Barre, Spring Brook Water Supply Company, Huntsville Plant.
112. York and vicinity, York Water Company.
113. York County Consolidated Water Company, Dallastown and Yoe.

With respect to the sewerage applications received since the establishment of the Department, 442 relate to sanitary sewers, 564 to combined sewers, 271 to sewage treatment works, and 87 have been for extensions of time. The applications as received by years are shown in the following table:

SEWERAGE AND SEWAGE TREATMENT APPLICATIONS.

Class of Application.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
Sanitary sewers,	39	68	81	48	52	45	57	52	442
Combined sewers,	68	71	82	112	71	69	49	42	564
Treatment works,	14	26	33	29	33	48	50	38	271
Extension of time,	.....	.....	3	11	12	13	33	15	87
Total,	121	165	199	200	168	175	189	147	1,364

It appears that in 271 instances sewage treatment problems have been investigated and passed upon or will engage the attention of the Department at an early date.

On December 31st, 1913, there were at least 93 sewage treatment plants, big and little, in operation or building in Pennsylvania. The following table is the list of these plants. There are many more treatment plants for smaller enterprises, private estates and individuals.

SEWAGE DISPOSAL PLANTS IN USE OR BEING ERECTED.

Cities.

1. Altoona, Blair County.
2. Lebanon, Lebanon County.
3. Philadelphia (Pennypack Creek District).
4. Reading, Berks County.

Boroughs.

5. Bristol, Bucks County.
6. Carlisle, Cumberland County.
7. Chambersburg, Franklin County.
8. Derry, Westmoreland County.
9. Dormont, Allegheny County (three plants).
10. Indiana, Indiana County.
11. Ligonier, Westmoreland County.
12. New Wilmington, Lawrence County.
13. Pleasantville, Venango County.
14. Washington and East Washington, Washington County.
15. West Chester, Chester County (two plants).

Township.

16. Mt. Lebanon Township, Allegheny Count (two plants).

State Institutions.

17. Chester Springs Soldiers' Orphans' School, Chester County.
18. Eastern Pennsylvania State Institution for the Feeble Minded and Epileptic, near Spring City, Chester County.
19. Homœopathic State Hospital for the Insane, near Allentown, Lehigh County.
20. Pennsylvania Industrial Reformatory, near Huntingdon, Huntingdon County.
21. Pennsylvania Soldiers' Orphans' Industrial School, Scotland, Franklin County.
22. Pennsylvania State College, Centre County.
23. Pennsylvania State Lunatic Hospital, near Harrisburg, Dauphin County.
24. Pennsylvania State Sanatorium for Tuberculosis No. 1, Mont Alto, Franklin County.
25. Pennsylvania State Sanatorium for Tuberculosis No. 2, Cresson, Cambria County.
26. Pennsylvania Training School, Morganza, Washington County.
27. State Asylum for the Chronic Insane of Pennsylvania, Wernersville, Berks County.
28. State Hospital for the Criminal Insane, Farview Station, Wayne County (temporary plant).
29. State Hospital for the Insane at Danville, Montour County.
30. State Hospital for the Insane, Southeastern District, Norristown, Montgomery County.
31. State Hospital for the Insane at Warren, Warren County.
32. State Institution for Feeble Minded of Western Pennsylvania, Polk, Venango County.
33. State Police Barracks, near Greensburg, Westmoreland County.

County and District Institutions.

34. Allegheny County Home and Hospital for Insane, Collier Township.
35. Allegheny County Work House, O'Hara Township.
36. Chester County Home and Hospital for Insane, West Bradford Township.
37. Delaware County House of Employment, Middletown Township.
38. Lehigh County Home and Almshouse, South Whitehall Township.
39. Middle Coal Field Poor District, Lehigh Township, Carbon County.
40. Montgomery County Home for the Poor, Upper Providence Township.
41. Schuylkill County Home and Hospital, near Schuylkill Haven.
42. Somerset County Home and Hospital, Somerset.

City Institutions.

43. Pittsburgh, North Side, City Home, O'Hara Township, Allegheny County.
44. Pittsburgh Water Works Department, Sewerage at Filter Plant, near Aspinwall, O'Hara Township, Allegheny County.
45. Scranton Poor District, Hillside Home, Newton Township, Lackawanna County.

Drainage Corporations.

46. Devon Drainage Company, Devon, Chester County.
47. Doylestown Sewerage Company, Doylestown, Bucks County.
48. Hanover Sewer Company, Hanover, York County.
49. Nazareth Sewerage Company, Nazareth, Northampton County.
50. Palmerton Disposal Company, Palmerton, Carbon County.
51. Wayne Sewerage Company, Wayne, Delaware County.

Land Improvement Companies.

52. Buck Hill Falls Company, Buck Hill Falls, Barrett Township, Monroe County.
53. Enola Realty Company, Enola, East Pennsboro Township, Cumberland County.

Associations and Private Systems for Boroughs and Villages.

54. Brittain, A. R., et al., East Stroudsburg, Monroe County.
55. Bryn Athyn Village Association, Bryn Athyn, Moreland Township, Montgomery County.
56. Cressman, Philip, for Perkasie, Bucks County.
57. Mt. Gretna Park, South Londonderry Township, Lebanon County.
58. Valley Camp Association, Lower Burrell Township, Westmoreland County.

Private Institutions.

59. Bethany Orphans' Home, Heidelberg Township, Berks County.
60. Dermady Sanatorium, Morton, Delaware County.
61. Free Hospital for Poor Consumptives, White Haven, Luzerne County.
62. Glen Mills Schools, Boys' Department, Glen Mills, Thornbury Township, Delaware County.
63. Glen Mills Schools, Girls' Department, Darling, Middletown Township, Delaware County.
64. Haverford College, Haverford, Haverford Township, Delaware County.
65. Home and Hospital of the Good Shepherd, Villa Nova, Radnor Township, Delaware County.
66. Innwood Sanitarium, near West Conshohocken, Lower Merion Township, Montgomery County.
67. Masonic Home, near Elizabethtown, West Donegal Township, Lancaster County.
68. Northwestern Anti-Tuberculosis League, Bells Camp, Foster Township, McKean County.
69. Perkiomen Seminary, Pennsburg, Montgomery County.
70. Philadelphia Jewish Sanatorium for Consumptives, Eaglesville, Lower Providence Township, Montgomery County.
71. Rush Hospital, Country Branch, near Malvern, Willistown Township, Chester County.
72. St. Francis Industrial School, Eddington, Bensalem Township, Bucks County.
73. Seybert Institution, Meadowbrook, Abington Township, Montgomery County.
74. Tressler Orphan Home, Loysville, Tyrone Township, Perry County.
75. Villa Nova College, Villa Nova, Radnor Township, Delaware County.
76. Western Pennsylvania Hospital for the Insane, Dixmont, Kilbuck Township, Allegheny County.
77. Williamson Free School of Mechanical Trades, Middletown Township, Delaware County.

Industrial Corporations.

78. Blaw Steel Centering Company, O'Hara Township, Allegheny County.
79. Carnegie Steel Company, near Greenville, West Salem Township, Mercer County.
80. Elk Tanning Company, Tannery at Stoneham, Mead Township, Warren County.
81. Flannery Bolt and American Vanadium Company, Collier Township, Allegheny County.
82. Howard J. W. and A. P., & Co., Ltd., Tannery, Columbus Township, Warren County, (near Corry).
83. Morrisville Rubber Works, Morrisville, Bucks County.
84. Nelson Valve Company, near Chestnut Hill, Springfield Township, Montgomery County.
85. New Jersey Zinc Company, Palmerton, Carbon County.
86. Norwich Lumber Company, Norwich Township, McKean County.
87. Pennsylvania Glue Company, Springdale, Allegheny County.
88. Rumpf's Sons, Frederick, Middletown Township, Bucks County.
89. Universal Portland Cement Company, Universal, Penn Township, Allegheny County.
90. Wood, Alan, Iron and Steel Company, Ivy Rock Station, Plymouth Township, Montgomery County.

Miscellaneous.

91. Parkside Hotel, Willow Grove, Moreland Township, Montgomery County.
92. Philadelphia Rapid Transit Company, Willow Grove Park, Moreland Township, Montgomery County.
93. Warren Water Company, Sewerage at Filter Plant, near Warren, Warren County.

WATER WORKS.

9. WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH.

This work has been done under Act of Assembly 182, approved April 22nd, 1905, P. L. 260, entitled "An Act to preserve the purity of the waters of the State, for the protection of the public health." The term, "Waters of the State" is defined by the act to include all streams and springs, and all bodies of surface and of ground water, whether natural or artificial, within the boundaries of the State.

The virgin waters of the State in their devious courses under ground and through the upland streams and main river channels gather many impurities, industrial wastes of great variety and germ laden, disease breeding poisons of human and animal origin. To preserve their purity absolutely is impossible. The law aims at the protection of waters yet undefiled and the continuing improvement of the present conditions and the attainment of a practical degree of purity in those now polluted. Measures advanced or instituted under the direction and supervision of the State Department of Health and under the law for the preservation of the purity of the waters of the State may be sub-divided into those for the prevention and regulation of the discharge of polluting matter into the State waters and for the purification of such discharges, set forth in other parts of this report; and those measures pertaining particularly to the protection, collection, transportation, and purification of the State waters appropriated for supply to the public, the subjects of the water works permits and decrees here discussed.

The above law prescribes that no water works system for the supply of water to the public shall be constructed or extended and that no additional source of supply shall be secured without a written permit from the Commissioner of Health. The investigations and inquiries of the State Department of Health in the consideration of the issuing of such permits have been confined to determining whether the supply or the circumstances of operation of the water works system are or are likely to become prejudicial to public health and what measures for the protection or purification of the supply shall be established.

An intelligent examination of and decision upon an application for a permit for water works extension demands, in each particular case, full information regarding the character and magnitude of the source of supply and the manner and means of collecting, conveying,

purifying, if necessary, and distributing the water and the capacity of the works therefor. This usually necessitates a personal investigation by a trained officer of the Department.

The need for detailed information is self-evident regarding the source of supply and all features which might influence its purity under varying conditions and during different seasons and kinds of weather. The magnitude of the source and the capacity of the water works system are also important from the standpoint of public health; for if insufficient, even if only during emergencies such as the demands of a fire or occurrence of a drought, the temporary and reckless introduction of a polluted emergency supply may result, or the populace may be driven to the use of springs and old wells in a built up community where such sources are extremely liable to pollution from neighboring privy vaults and cesspools. Again, it is imperative to have at hand the full detailed information regarding the construction of the water works system, the location of all valves and drain and blow-off connections, because the unlooked for introduction of pollution into some part of the works may necessitate the speedy flushing and draining of all or part of the system, the cutting out of some particular source and the readjustment of the system under a new arrangement of operation. Before it was required by law that the detailed plans of all water works systems should be on file in the office of the State Department of Health, it often happened that the local water works officials did not have this information available for their own use, especially in the smaller systems. In many such instances the works were erected, or at least extensions, valves and detail arrangements were put in from time to time under the personal direction of a local superintendent without plans, and much of the information regarding the system was lost to the water works owners with the passing of the superintendent. In connection with the subject it may also be important to know about the private wells and springs in the town.

The permits and decrees issued to the water works owners are based and conditioned upon the construction of the works and their operation in strict accordance with the plans and proposed methods of operation filed for approval or in accordance with specifically required modifications thereof. It is therefore imperative that complete plans and a report of the water works be filed with the Department, as required by the above law, and that each application be accompanied by detailed plans and a report of the proposed work. The permits and decrees further require the fulfillment of such specific stipulations as the information gathered by the Department indicates should be carried out in order that the proposed sources of supply or extensions to existing water works may not be prejudicial to public health. In addition to the requirements for the efficient operation of the works these stipulations refer to provision for the

removal of the causes of possible pollution of the sources of water supply and to protective measures such as the sanitary patrol of the drainage areas.

The preparation of these plans (of which blue prints are acceptable) in accordance with first class modern engineering practice and their prompt submission at the time of filing the application greatly facilitate and expedite the work of the Department in acting upon the proposition. Where the supply comes from a comparatively small stream not many miles below the head waters, so that a house to house patrol of the drainage area can be maintained and the methods of sewage disposal and possible sources of pollution can be regulated with the sufficient certainty to constitute some degree of protection of the purity of the supply, then the plans should include a map of the drainage area showing the principal topographical features, all houses, roads, streams, and other sources of possible pollution.

With respect to the sixty-six water works permits and decrees issued during the year, thirty-five embraced surface sources, fourteen ground sources, and seventeen a combination of the two. Complete purification is required of the surface sources in thirty cases and of the ground water in one case. Chemical disinfection is required in thirty cases for use in connection with emergency or auxiliary sources, or to meet special conditions, or as a temporary safeguard pending the installation of complete purification plants. The thirty-one cases where complete purification is required or approved are as follows:

WATER WORKS PERMITS AND DECREES ISSUED DURING 1913, APPROVING OR REQUIRING FILTRATION.

1. Apollo Water Works Company.
2. Bangor Water Company.
3. Beaver Valley Water Company.
4. Bloomsburg Water Company.
5. Bristol Borough (First)
6. Bristol Borough (Second).
7. Cairnbrook Water Company.
8. Citizens Water Company of Canton.
9. Clear Springs Water Company.
10. Consolidation Coal Company.
11. Danville Borough.
12. East Greenville Borough.
13. Falls Creek Borough.
14. Greenville Water Company.
15. Haysville Water Company.
16. Hershey Water Company.
17. Homestead Borough.
18. Johnsonburg Water Company.
19. Mar-Lin Water Company—Filtration to be approved and installed before using source.
20. Midland Water Company.
21. Moreland Spring Water Company.
22. New Oxford Borough.
23. Pittsburgh Coal Company.
24. Sharon Water Works Company.
25. State Hospital for the Insane (near Danville).
26. Suburban Water Company of Allegheny County.
27. Tarentum Borough (First)
28. Tarentum Borough (Second).
29. Troy Borough.
30. Windber Water & Power Company.
31. York County Consolidated Water Company.

The applications for Numbers 13, 18, 19, 22, 26, 27 and 30 in the foregoing table were received prior to 1913. Numbers 5 and 24 were decrees, not in response to application. The preparation of filtration plans for sources proposed by the applicants to be used unfiltered or to make safe existing sources is required in Numbers 2, 7, 17, 18, 19, 26 and 30. The modification of proposed filtration plans is required by Numbers 15 and 27. Approval of plans for the introduction of filters is given in Numbers 9, 10, 12, 14, 16, 20, 22, 23, 28, 29 and 31. The remaining numbers in the above list, namely, 1, 3, 4, 5, 6, 8, 11, 13, 21, 24 and 25, concern the extension or modification of filtered water systems.

The thirty cases where chemical disinfection is approved or required are as follows:

WATER WORKS PERMITS AND DECREES ISSUED IN 1913, APPROVING OR REQUIRING CHEMICAL DISINFECTION.

1. Ambridge Borough (Emergency).
2. Bangor Water Company (Pending filtration).
3. Beaver Valley Water Company (With filtration).
4. Bloomsburg Water Company (With filtration).
5. Bristol Borough (First) (With filtration).
6. Bristol Borough (Second) (With filtration).
7. Citizens Water Company of Canton (Occasional crude filtration pending improvements).
8. Clear Springs Water Company (Pending filtration).
9. Danville Borough (With filtration).
10. East Greenville Borough (Pending filtration).
11. Falls Creek Borough (With filtration).
12. Garrett Water Company, (Temporary permit).
13. Halifax Water Company (Temporary permit).
14. Haysville Water Company (Pending filtration).
15. Hershey Water Company (Pending filtration).
16. Homestead Borough (Pending filtration).
17. Johnsonburg Water Company (Pending filtration).
18. Lebanon City (Pending filtration).
19. Midland Water Company (Pending filtration).
20. Moreland Spring Water Company (With filtration).
21. New Oxford Borough (Pending filtration).
22. Nicholson Water Company (Temporary permit).
23. Pittsburgh Coal Company (With filtration).
24. Richland Township Water Company (Temporary permit)
25. Sharon Water Works Company (With filtration).
26. State Hospital for the Insane (near Danville) (With filtration).
27. Suburban Water Company of Allegheny County, Pennsylvania (Pending filtration).
28. Troy Borough (Pending filtration).
29. Windber Water & Power Company—System at Berwindino, Paint Township, Somerset County (Temporary permit).
30. York County Consolidated Water Company (Pending filtration).

In twenty instances the chemical disinfection provided for in the foreging list of permits was already being carried out at the time the permits were issued, the treatment having been started in emergencies, in many instances under the responsible supervision of the Department officers, or in accordance with the terms of previous permits for systems the extension or modification of which is provided for in the 1913 permits. Numbers 1, 2, 5 and 13 require the temporary or emergency installation of chemical disinfecting plants where not proposed by the water works owners. The applications for Numbers 12, 27 and 29 were received in 1912; that for Number 1

was received in 1911 for a proposed water works system for which arrangements were not completed until 1913. Numbers 11 and 17 will be noted among the above twenty instances where, to meet emergencies, disinfecting plants were installed prior to the issuing of the permits, although formal approval of the plants was delayed, the application for Number 11 having been received in 1911 and that for Number 17 in 1908.

SUMMARY OF ALL PERMITS AND DECREES CONCERNING WATER WORKS.

There have been 567 water works permits and decrees issued since the creation of the State Department of Health.

WATER WORKS PERMITS AND DECREES ISSUED—1905-1913.

1905-06,	23	1911,	78
1907,	25	1912,	116
1908,	72	1913,	66
1909,	84		
1910,	103	Total,	567

In some instances several permits were issued to the same applicant. The 567 permits or decrees have involved 381 owners of water works systems including four water companies whose systems, rights, and obligations have passed to other owners, which latter owners have since received permits or decrees covering the entire systems. The owners may be classified:—

Municipal water works systems,	77	Other institutions,	3
Water works corporations,	259	Associations and private citizens,	27
State Institutions,	7	Industrial works,	8
			381

There are 589 cities, boroughs, and townships in Pennsylvania now supplied with water by water works systems that have been examined and made the subjects of decrees by the Department. A water company may supply several towns and in a number of municipalities more than one water company are operating, as will appear in the detailed statement that follows:

EXPLANATION OF TABLE OF PERMITS AND DECREES ISSUED UP TO DECEMBER 31ST, 1913.

In the first column of the following table are entered alphabetically, with consecutive numbers, the cities, boroughs, and townships comprising the charter territories and water supply districts of the water works systems covered by the permits and decrees of the State Department of Health. To indicate cases of municipal ownership consecutive numbers are entered in the second column opposite the names

of municipal owners. In cases of private ownership the names of the municipalities are followed by the names of the water works owners in parenthesis, except that where the names of municipalities begin the titles of the water works owners, the latter are omitted in the first column and entered opposite the former, in the third and fourth columns.

The third and fourth columns contain respectively the names of private water works corporations and unincorporated private owners arranged alphabetically, with consecutive numbers, and followed by the names of the municipalities comprising the charter territories and water supply districts, except where these latter are shown immediately opposite in the first column. The number of permits and decrees issued are entered in the last columns opposite the name of water works owner where it appears in alphabetical order.

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
1 Abington township, Montgomery county (Springfield Cons. Water Co.) (Weldon Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
2 Akron, Lancaster county, ...	1	.....	.....	....	....	....	....	....	1	....	....	1
3 Albion, Erie county (See also Albion Water Co.)	2	.....	.....	....	....	....	....	1	....	....	....	1
		1 Albion Water Co. (Albion), ...	.....	....	....	....	1	....	....	....	....	1
4 Aldan, Delaware county (Springfield Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	..
5 Aleppo township, Allegheny county (Haysville Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		Allegheny Valley Water Co. (purchased by Tarentum Water Co.), ...	.....	....	....	....	....	....	....	....	....	....
Allison Park, Hampton township, Allegheny county (See also Wyland, John F.)	....	2 Allison Park Water Co.,.....	.....	....	....	....	....	....	1	....	....	1
			1 Alwine, Jerry (Johnstown, Cambria county.)	....	....	1	....	....	....	....	....	1
6 Ambridge, Beaver county, ...	3		.....	....	....	....	....	....	....	....	1	1
Annville village, Lebanon county (N. and S. Annville townships.)	....	3 Annville Water Co., ...	.....	2	....	2	?	....	....	....	....	6
		4 Anthracite Water Co. (Supplies Frackville, Gilberton and Shenandoah boroughs, and Mahanoy and West Mahanoy townships, Schuylkill county.)	.....	....	....	....	....	....	....	....	1	1

7 Apollo, Armstrong county,		5 Apollo Water Works Co. (Also supplies Leechburg, Armstrong Co.)									1	1	
8 Arendtsville, Adams county,		6 Arendtsville Water Co.,					1					1	
9 Arnold, Westmoreland county (Kensington Water Co.)													
10 Ashland, Schuylkill county,	4								1			1	
11 Ashley, Luzerne county (Spring Brook Water Supply Co.)													
12 Athens, Bradford county (Fairview view Water Co.)													
13 Austin, Potter county,	5			1				2				3	
14 Avalon, Allegheny county (Ohio Valley Water Co.)													
15 Avoca, Luzerne county (Spring Brook Water Supply Co.)													
16 Avonmore, Westmoreland county,	6						1					1	
17 Baden, Beaver county,	7				1							1	
		7 Bald Eagle Water Co. (Tyrone, Blair Co.)					1					1	
18 Baldwin township, Allegheny county (South Pittsburgh Water Co.)													
19 Bangor, Northampton county,		8 Bangor Water Co. (Also supplies Roseto, Northampton county.)							1	1		2	
20 Barnesboro, Cambria county,		9 Barnesboro Water Co. (Merged in 1913 into Northern Cambria Water Co. System in Barnesboro purchased by borough in 1913.)				1						1	
21 Bath, Northampton county,	8							1				1	
		10 Beaver Creek Water Co. (Swatara township, Dauphin county.)					1					1	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
22 Beaver Falls, Beaver county (Beaver Valley Water Co.	....	.....	.....	....	....	....	....	....	...	....	....	.
		11 Beaver Valley Water Co. (Supplies Beaver Falls, College Hill, Conway, Fallston, Freedom, New Brighton, Patterson Heights, Rochester, and W. Bridgewater Boroughs and Rochester township, Beaver county.)	.....	....	....	....	....	....	....	1	1	2
23 Beaver Meadow, Carbon county (Hazleton Water Co.)	....	.....	.....	....	....	....	....	....	....	....	...	
24 Beech View, Allegheny county (So. Pittsburgh Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	...
25 Bellevue, Allegheny county (Ohio Valley Water Co.)	....	.....	.....	...	....	....	....	....	....	....	....	...
26 Ben Avon, Allegheny county (Ohio Valley Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	
27 Bensalem township, Bucks county (Trevose Manor Spring Water Co.	....	.....	.....	....	....	....	....	....	....	....	....	....
		12 Bens Creek Water Co. (Portage township, Cambria county.)	.....	1	....	....	....	....	....	....	....	1
28 Benson, Somerset county (S. P. Berkebile) (W. A. Snably.)	....	.....	.....	....	....	....	....	....	....	....	...	...
29 Benton, Columbia county, ...	....	13 Benton Water Co., ...	.....	....	....	....	....	....	....	....	1	1
			2 Berkebile, S. P. (Benson borough and Conemaugh township, Somerset county.)	....	...	....	....	....	....	....	1	1
30 Berwick, Columbia county, ...	....	14 Berwick Water Co., ...	.....	....	....	1	....	1	1	2	....	5

31 Bethel township, Allegheny county (South Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....	....
32 Bethlehem, Northampton county (See also Beth. City Water Co. for "West Bethlehem.")	9			....	1	1	....	....	....	1	....	3	
		15 Bethlehem City Water Co. (Supplies in Lehigh county, part of Bethlehem, known as West Bethlehem, and Fountain Hill Boroughs, and Hanover and Salisbury townships; in Northampton county—Northampton Heights and South Bethlehem boroughs and Lower Saucon township.)		....	....	....	....	....	....	1	....		
			3 Bethlehem Steel Co. (S. Bethlehem, Northampton county.)	....	....	....	....	...	....	1	....	1	
33 Big Beaver township, Beaver county (Koppel Water Co.)	....			....	....	....	....	....	....	....	....	...	
34 Bigler township, Clearfield county (Madera Water Co.) (Ramey Water Co.)	...			....	....	....	....	....	....	....	....	....	
35 Biglerville, Adams county, ...	....	16 Biglerville Water Co., ...		....	....	1	....	....	....	....	....	1	
36 Big Run, Jefferson county (Punxsutawney Water Co.)	....			....	....	....	....	....	....	....	....	....	
37 Black Lick township, Cambria county (Marie Water Co.) (Nanty-Glo Water Co., mine.)	....			....	....	....	....	....	....	....	....	...	
		17 Blackwood Water Co. (Reilly township, Schuylkill county.)		....	....	....	1	....	....	....	....	1	
38 Blairsville, Indiana county, ...	10			....	....	....	....	....	....	1	....	1	
		18 Blandburg Water Co. (Reade township, Cambria county.)		....	....	....	....	1	....	....	....	1	
39 Bloomfield, Perry county, ...	....	19 Bloomfield Water and Sewer Co., ...		....	....	....	1	....	....	....	....	1	
40 Bloomsburg, Columbia county, ...	....	20 Bloomsburg Water Co., ...		....	....	....	....	....	....	2	1	3	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
41 Blossburg, Tioga county,	....	21 Blossburg Water Co.,		....	....	1	....	....	....	....	....	1
		22 Blue Mountain Consolidated Water Co. (Supplies in Monroe county, Hamilton and Ross townships and in Northampton county, Nazareth, Pen Argyl, and Wind Gap boroughs and Bushkill, Lower Nazareth, Plainfield, Upper Nazarth, and Washington township.)		....	....	....	....	....	....	1	1	2
		23 Blue Ridge Water Supply Co. (Washington township, Franklin county.)		....	1	....	....	....	....	....	....	1
42 Blythe township, Schuylkill county (Silver Creek Water Co.)	....			....	....	....	....	....	....	....	....	....
Boalsburg, Town of, Harris township, Centre county.	....	24 Boalsburg Water Co.,		....	....	....	....	1	....	....	....	1
Boiling Springs, So. Middleton ship, Cumberland county (See Bucher, J. C.)	....			....	....	....	....	....	....	....	....	....
			4 Boyer, J. Calvin (Monroe twp., Snyder Co.)	....	....	....	....	1	....	....	....	1
			5 Boyer, J. Calvin (Perry twp., Snyder Co.)	....	....	....	....	1	....	....	....	1
43 Brackenridge, Allegheny county (Tarentum Water Co.)	....			....	....	....	....	....	....	....	....	....
44 Braddock township, Allegheny county (Penna. Water Co.)	....			....	....	....	....	....	....	....	....	....
45 Bradford (city), McKean county, ..	11			....	1	....	1	1	....	....	....	3
45 Bradford township, McKean county (S. Bradford Water Co.)	....			....	....	....	....	....	....	....	....	..

		25 Bradford County Water Co. (Sayre.)		1	....	....	....	....	....	....	....	1
47 Briar Creek township, Columbia county.	....	26 Briar Creek Water Supply Co.,		....	....	....	1	....	....	....	....	1
			6 Brickel, B. W. (Dallas, Luzerne county.)	....	....	....	1	....	....	....	....	1
48 Bridgeport, Montgomery county (Norristown Ins. and Water Co.)	....			....	....	....	....	....	....	....	....	
49 Bridgeton township, Bucks county (Raymond D. Stone.)	....			....	....	....	....	....	....	....	....	..
50 Bridgeville, Allegheny county (S. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....
		27 Bright Run Water Co. (Butler township, Schuylkill county.)		....	....	....	....	1	....	....	....	1
51 Brisbin, Clearfield county (W. Houtzdale Water Co.)	....			....	....	....	....	....	....	....	....	....
52 Bristol, Bucks county (See also Bristol Water Co.) (Borough took over plant of Bristol Water Co.—May 14, 1912.)	12			....	....	....	....	1	....	1	2	4
		28 Bristol Water Co. (Sold to Bristol borough.)		1	....	....	....	1	....	....	....	2
53 Brockwayville, Jefferson county, ..	....	29 Brockway Crystal Water Co.,		....	....	....	....	1	....	....	....	1
54 Brookville, Jefferson county, ...	....	30 Brookville Water Co. (Also supplies Rose township, Jefferson county) (Plant sold to borough, Jan., 1912.)		....	....	....	....	2	....	....	....	2
			7 Bucher, J. C. (Boiling Springs, South Middleton township, Cumberland county.)	....	....	....	...	1	...	...	....	1
55 Burrell township, Indiana county (Josephine Water Co.)	....			....	....	....	....	....	....	....	....	
56 Bushkill township, Northampton county (Blue Mountain Cons. Water Co.)	....			...	....	....	....	....	....	....	....	....
57 Butler, Butler county, ...	....	31 Butler Water Co.,		....	....	....	....	1	....	....	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
58 Butler township, Schuylkill county (Girard Water Co.) (Bright Run Water Co.)	....	.....	.....	....	....	....	....	....	....	....	...	....
		32 Cairnbrook Water Co. (Shade township, Somerset county.)	.....	....	....	....	....	....	....	....	1	1
59 Cambria township, Cambria county (Ebensburg Coal Co.)	....	.....	.....	....	....	....	....	....	....	....	....	...
60 Cambridge Springs, Crawford county,	13	.....	.....	....	2	....	....	....	....	....	....	2
61 Camp Hill, Cumberland county (Riverton Cons. Water Co.)	....	.....	.....	....	....	....	....	....	....	...	....	....
62 Canonsburg, Washington county (North Strabane Water Co.)	...	.....	.....	....	....	....	....	....	....	....	....	....
63 Canton, Bradford county (Citizens Water Co. of Canton.)	....	.....	.....	....	....	....	....	....	....	....	....	....
64 Carnegie, Allegheny county (South Pittsburgh Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
65 Carrick, Allegheny county (South Pittsburgh Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
66 Carroll township, Washington county (Donora Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
67 Cass township, Schuylkill county (Minersville Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
68 Catasauqua, Lehigh county (See also Clear Springs Water Co.)	14	.....	.....	....	....	1	1	....	....	....	....	2
69 Catawissa, Columbia county, ...	....	33 Catawissa Water Co., ...	.....	....	....	....	....	1	....	1	....	2

70 Cecil township, Washington county (Penna. Training School) North Strabane Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
71 Chambersburg, Franklin county, ...	15	....	....	....	1	....	....	....	1	....	....	2
72 Chapman township, Clinton county (Absalom Farwell.)	....	....	....	....	....	....	....	....	....	....	....	....
73 Charleroi, Washington county, ...	....	34 Charleroi Water Co. (Consolidated Aug. 15, 1912, and now part of Tri-Cities Water Co.)	....	....	....	....	....	1	....	....	....	1
74 Chartiers township, Allegheny county (S. Pittsburgh Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
75 Cheltenham township, Montgomery county (Ogontz Water Co.) (Springfield Cons. Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
76 Chester (city), Delaware county (New Chester Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
77 Chester township, Delaware county (Edgemont Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
78 Cheswick, Allegheny county (Tarentum Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
		35 Chichester Water Co. (Marcus Hook, Delaware county.)	....	....	....	1	1	....	....	....	....	2
79 Christiana, Lancaster county, ...	....	36 Christiana Gravity Water Co., ...	....	....	....	....	....	....	1	1	....	2
		37 Citizens Water and Gas Co. of Williamsport (Lycoming county.)	....	....	....	....	....	1	....	....	....	1
		38 Citizens Water Co. of Canton (Bradford Co.)	....	....	....	....	....	....	....	....	1	1
		39 Citizens Water Co. of Confluence (Confluence, Somerset Co.)	....	....	....	....	....	....	....	1	....	1
		40 Citizens Water Co. of Gordon (Gordon Schuylkill county.)	....	....	....	....	....	1	....	....	....	1
		41 Citizens Water Co. of Kittanning (Also supplies Rayburn township and Wickboro borough, Armstrong county.) (Sold to Armstrong Water Co.)	....	1	....	....	....	....	....	....	....	1
		42 Citizens Water Co. of New Bethlehem (Supplies South Bethlehem, Armstrong county and New Bethlehem, Clarion county.)	....	....	....	....	1	....	....	....	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
		43 City of New Castle Water Co. (New Castle, Lawrence county.)		....	....	....	....	....	....	1	....	
80 Clarion, Clarion county,	....	44 Clarion Water Co.,		....	1	....	2	....	1	....	....	4
81 Clearfield, Clearfield county,	....	45 Clearfield Water Co.,		....	....	....	1	....	....	....	....	
		46 Clear Springs Water Co. (Supplies in Lehigh county, Catasauqua and Coplay boroughs and Whitehall township; in Northampton county, Northampton and North Catasauqua boroughs.)		....	....	....	....	....	....	....	1	1
82 Clifton Heights, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	...
		47 Clymer Water Co. of Indiana (Indiana county.)		....	1	....	1	1	....	....	....	3
83 Coaldale, Schuylkill county (Panther Valley Water Co.)	....			....	....	....	....	....	....	....	....	....
84 Coal township, Northumberland county (Roaring Creek Water Co.)	....			....	....	....	....	....	....	....	....	....
85 Coatesville, Chester county,	16			....	....	....	....	....	....	3	....	3
86 College Hill, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	....	....
87 College township, Centre county (University Water Co.)	....			....	....	....	....	....	....	....	....	....
88 Collier township, Allegheny county (South Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....
89 Collingdale, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....

Colver, Cambria township, Cambria county.	....	Colver Water Co. (operates system of Ebensburg Coal Co. *q. v.*)		....	....	....	....	....	....	....	....	....	....
90 Colwyn, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....	....
91 Conemaugh township, Somerset Co. (S. P. Berkebile) (W. A. Snably.)	....			....	....	....	....	....	....	....	....	....	....
92 Confluence, Somerset county (Citizens water Co. of Confluence.)	....			....	....	....	....	....	....	....	....	....	....
93 Conneaut Lake, Crawford county,..	17			....	....	....	....	....	1	....	....	1	
94 Conneautville, Crawford county,..	18			....	....	....	....	1	1	....	....		
95 Conshohocken, Montgomery county (Springfield Cons. Water Co.)	....			....	....	....	....	....	....	....	....	....	....
		48 Consolidated Water Co. of Coudersport, Potter county (bought Citizens Water Co., Oct. 16, 1906.)		....	....	....	....	....	....	1	....	1	
			8 Consolidation Coal Co. (Jenner township, Somerset county.)	....	....	....	....	....	....	....	1	1	
96 Conway, Beaver county. (See also Beaver Valley Water Co.)	19			....	....	....	1	....	....	....	....	1	
97 Conyngham township, Luzerne county (Glen Brook Water Co.)	....			....	....	....	....	....	....	....	....	....	....
98 Coopersburg, Lehigh county, ...	20			....	....	....	....	....	1	....	....	1	
99 Coplay, Lehigh county (Clear Springs Water Co.)	....			....	....	....	....	....	....	....	....	....	....
100 Coraopolis, Allegheny county, ...	21			....	....	....	....	....	....	....	1	1	
101 Coudersport, Potter county (Consolidated Water Co. of Coudersport bought Citizens Water Co., Oct. 16th, 1906.)	....			....	....	....	....	....	....	....	....	....	....
102 Courtdale, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	....
103 Crafton, Allegheny county (South Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....	....
104 Cresson, Cambria county. (See also Cresson Water Co.)	22			....	....	....	....	1	....	....	....	1	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
105 Cresson township, Cambria county,	....	49 Cresson Water Co. (also supplies Cresson and Sankertown, Cambria county.)	.....	....	....	....	....	1	....	....	....	1
106 Cressona, Schuylkill county (Schuylkill Haven Gas and Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
			9 Crosby Gas Co. (Newerf Village, Norwich township, McKean county.)	1	....	....	....	....	....	....	....	1
107 Cumberland Valley township, Bedford county (Evitts Creek Water Co.)	....	.....	.....	....	....	....	...	....	....	....	....	....
			10 Curtis (J. G.) Leather Co. (Ludlow, Hamilton township, McKean county.)	....	....	....	....	1	....	....	....	1
108 Dale, Cambria county (Johnstown Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
109 Dallas, Luzerne county. (See also B. W. Brickel.)	....	50 Dallas Water Co., ...	.....	1	....	....	....	....	....	....	....	1
110 Dallastown, York county (York County Consolidated Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
111 Danville, Montour county. (See also State Hospital.)	23	.....	.....	....	....	....	....	....	....	1	1	2
112 Darby, Delaware county (Springfield Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
113 Darby township, Delaware county (Springfield Water Co.)	....	.....	.....	....	....	....	....	....	....	..	....	....

114 Dauphin, Dauphin county,	....	51 Dauphin Consolidated Water Supply Co. (also supplies East Pennsboro township, Cumberland county—Middle Paxton and Susquehanna townships, Dauphin county.)		....	....	1	1	....	....	....	....	2
115 Dawson, Fayette county,	24			....	....	....	....	....	....	1	....	1
116 Debuno township, Schuylkill county (Mahanoy City Water Co.)	....			....	....	....	....	....	....	....	....	....
117 Delaware township, Pike county (Dingmans Ferry Water Co.)	....			....	....	....	....	....	....	....	....	....
118 Denver, Lancaster county,	25			....	....	....	1	....	....	....	....	1
119 Derry township, Dauphin county (Hershey Water Co.)	....			....	....	....	....	....	....	....	....	....
		52 Diamond Water Co. of Hazleton (Hazleton and West Hazleton, Luzerne county.)		....	....	....	1	....	....	....	1	1
		53 Dickerson Run Water Co. (supplies New Dickerson Run Village, Dunbar and Franklin townships, Fayette county.)		....	....	....	....	....	1	....	....	1
120 Dickson City (borough), Lackawanna county (Scranton Gas and Water Co.)	....			....	....	....	....	....	....	....	....	....
121 Dillsburg, York county,	....	54 Dillsburg Water Co.,		....	....	....	....	1	....	....	....	1
Dingmans Ferry, Delaware township, Pike county.	....	55 Dingmans Ferry Water Co.,		....	....	....	....	1	....	....	....	1
122 Donora, Washington county,	....	56 Donora Water Co. (Consolidated Aug. 15, 1912 and now part of Tri-Cities Water Co.)		....	....	....	....	1	....	....	....	
123 Dorranceton, Luzerne county (Spring Brook Water Supply Co.)				....	....	....	....	....	....	....	....	....
124 Dover, York county,	26			1	....	....	....	....	....	....	....	
125 Doylestown, Bucks county,	27			....	....	....	....	1	....	....	....	
126 Du Bois, Clearfield county. (See also John E. Du Bois.)	28			....	....	....	1	....	....	....	....	1
			11 Du Bois, John E. (Du Bois.)	....	....	....	1	....	....	....	....	1
127 Dunbar township, Fayette county (Dickerson Run Water Co.)	....			....	....	....	....	....	....	....	....	....

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
128 Duncannon, Perry county (Trout Run Water Co.)	....			....	....	....	....	....	....	....	....	....
129 Duryea, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
130 Eagles Mere, Sullivan county, ...	....	57 Eagles Mere Water Co.,		....	....	....	....	1	....	....	....	1
131 East Bethlehem township, Washington county (Vesta Coal Co.)	....			....	....	....	....	....	....	....	....	....
132 East Brady, Clarion county, ...	....	58 East Brady Water Works Co.,		....	....	....	....	1	....	1	....	2
133 East Deer township, Allegheny county (Tarentum Water Co.)	....			....	....	....	....	....	....	....	....	....
134 East Donegal township, Lancaster county.	....	59 East Donegal Water Co.,		....	....	....	....	....	....	1	....	1
			12 Eastern Penna. State Inst. for the Feeble-Minded and Epileptic (E. Vincent township, near Spring City, Chester county.)	1	....	....	....	....	....	...	...	1
135 East Greenville, Montgomery county,	29			....	....	....	....	....	....	1	1	2
136 East McKeesport, Allegheny county,	....	60 East McKeesport Water Co. (also supplies North Versailles township and Wall and Wilmerding boroughs, Allegheny county.)		....	1	....	....	....	....	....	....	1
137 East Mauch Chunk, Carbon county, (Mauch Chunk Water Co.)	....			....	....	....	....	....	....	....	....	....
		61 East Mere Water Co. (for East End Village, Swatara township, Dauphin county) (Sold to Harrisburg.)		....	....	...	1	....	....	....	....	1

138 Easton (city), Northampton county, (Lehigh Water Co.) (So. Easton Water Co.)	....			....	....	....	....	....	....	....	....	....
139 East Pennsboro township, Cumberland county (Dauphin Cons. Water Supply Co.) (Riverton Cons. Water Co.) (H. M. Horner.)	....			....	....	....	....	....	....	....	....	....
140 East Pittsburgh, Allegheny county (Penna. Water Co.)	....			....	....	....	....	....	....	....	....	....
141 Easttown township, Chester county (Springfield Cons. Water Co.)	....			....	....	....	....	....	....	....	....	....
142 East Union township, Schuylkill county (Mahanoy City Water Co.)	....			....	....	....	....	....	....	....	....	....
143 East Vincent township, Chester county (Eastern Penna. State Inst. near Spring City.)	....			....	....	....	....	....	....	....	....	....
			13 Ebensburg Coal Co. (System at Colver, Cambria township, Cambria county, taken over by Colver Water Co. in 1913.)	....	....	....	....	....	1	....	....	1
144 Eddystone, Delaware county (Ridley Water Co.) (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....
		62 Edgemont Water Co. (Chester township, Delaware county.)		....	....	1	1	....	....	....	....	2
145 Edgewood, Allegheny county (Penna. Water Co.)	....			....	....	....	....	....	....	....	....	....
146 Edinboro, Erie county,	30			....	....	....	....	1	1	....	....	2
147 Edwardsville, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
148 Eldred, McKean county (Galeton-Eldred Water Co.)	....			....	....	....	....	....	....	....	....	....
149 Ellwood City (borough), Lawrence county.	....	63 Ellwood Water Co.,		....	1	1	....	....	....	1	....	3
150 Emaus, Lehigh county. (See also Mountain Water Co.)	31			....	....	....	....	....	2	....	1	3
151 Emlenton, Venango county,	....	64 Emlenton Water Co.,		....	....	1	....	....	....	....	....	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
152 Emporium, Cameron county,	....	65 Emporium Water Co.,		....	....	....	....	2	....	1	....	3
153 Emsworth, Allegheny county (Ohio Valley Water Co.)	....			....	....	....	....	....	....	....	....	....
Enola Village, E. Pennsboro township, Cumberland county (Dauphin Cons. Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
154 Ephrata, Lancaster county,	32			....	....	....	....	....	1	....	....	1
155 Erie (city), Erie county,	33			....	....	....	....	....	....	1	....	1
		66 Evitts Creek Water Co. (Cumberland Valley township, Bedford county.)		....	....	....	....	....	....	1	....	1
156 Exeter, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
157 Exeter township, Berks county (Mt. Penn Suburban Water Co.)	....			....	....	....	....	....	....	....	....	....
		67 Extension Water Co. of Penbrook (Dauphin county.)		....	....	....	1	....	....	....	....	1
158 Fairchance, Fayette county,	34			....	....	1	....	....	....	....	....	1
159 Fairview township, York county (Riverton Cons. Water Co.)				....	....	....	....	....	....	....	....	....
		68 Fairview Water Co. (Athens, Bradford county.)		1	....	....	....	....	....	....	....	1
160 Fallowfield township, Washington county (Charleroi Water Co.)	....			....	....	....	....	....	....	....	....	....
161 Falls Creek, Clearfield county,	35			....	....	....	....	1	....	....	1	2

162 Fallston, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	....	....	....
163 Farrell (formerly South Sharon), Mercer county (Sharon Water Works Co.)	....			....	....	....	....	....	....	....	....	....	....
			14 Farwell, Absalom (Chapman township, Clinton county.)	....	....	1	....	....	....	....	....	....	1
164 Ferguson township, Centre county (University Water Co.)	....			....	....	....	....	....	....	....	....	....	....
165 Ferndale, Cambria county (Johnstown Water Co.)	....			....	....	....	....	....	....	....	....	....	....
		69 Florin Water Co. (Mt. Joy township, Lancaster county.)		....	....	....	....	....	....	1	....	....	1
166 Forty Fort, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	....
167 Fountain Hill, Lehigh county (Bethlehem City Water Co.)	....			....	....	....	....	....	....	....	....	....	....
Foxburg, Town of, (Richland township), Clarion county.	....	70 Foxburg Water Works Co.,		....	....	1	....	....	....	....	....	....	1
168 Frackville, Schuylkill county (Anthracite Water Co.)	....			....	....	..	....	....	....	....	....	....	....
169 Franconia township, Montgomery county (Reliance Water Co.)	....			....	....	....	....	....	....	..	....		
170 Franklin (city), Venango county (Permits* to Venango Water Co. —plant purchased by city.)	36			*1	*2	....	....	....	....	3	....	....	6
171 Franklin township, Fayette county (Dickerson Run Water Co.)	....			....	....	....	....	....	....	....	.		
172 Freedom, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	.		
173 Freeport, Armstrong county,	....	71 Freeport Water Works Co.,		....	....	1	....	....	....	....	....	....	1
174 Galeton, Potter county,	....	72 Galeton-Eldred Water Co. (also supplies Eldred, McKean Co.)		....	....	....	....	1	....	2	....	....	3
175 Garrett, Somerset county,	....	73 Garrett Water Co. (also supplies Summit township, Somerset county.)		....	....	....	....	....	....	....	1	1	
176 Genesee township, Potter county, ..	....	74 Genesee Citizens Water Co.,		....	....	....	....	....	....	1	....	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
177 Gettysburg, Adams county,	....	75 Gettysburg Water Co.,		....	....	....	....	....	....	3	....	3
178 Gilberton, Schuylkill county. (See also Anthracite Water Co.)	....	76 Gilberton-Schuylkill Water Co.,		....	....	....	....	1	....	....	....	1
179 Girardville, Schuylkill county. (See also Girard Water Co.)	....	77 Girardville Water Co.,		....	....	....	....	1	....	....	....	1
		78 Girard Water Co. (supplies Butler and West Mahanoy townships; Girardville and Shenandoah boroughs, Schuylkill county.)		....	....	....	....	....	....	....	2	2
		79 Gladehurst Water Co. (Somerset township, Somerset county.)		....	....	1	....	....	....	....	....	1
		80 Glen Brook Water Co. (Conyngham township, Luzerne county.)		1	....	....	....	....	....	....	....	1
180 Glenfield township, Allegheny county (Haysville Water Co.)	....			....	....	....	....	....	....	....	....	
			15 Glen Mills Schools, Girls Department (Middletown township, Delaware county.)	....	....	...	....	...	...	1	....	1
181 Glenolden, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	
182 Glen Rock, York county,	37			....	....	....	....	1	1	....	....	2
183 Gordon, Schuylkill county (Citizens Water Co. of Gordon.)	....			....	....	....	....	....	....	....	....	
		81 Gravel Hill Water Supply Co. (North Londonderry township, Lebanon county.)		....	....	....	....	1	....	....	....	1

184 Great Bend, Susquehanna county (Hallstead Water Co.)	....			....	....	....	....	....	....	....	....	....	....	
185 Greencastle, Franklin county, ...	38			....	....	....	....	1	1	....	....		2	
		82 Green Hill Water Co. (Logan township, Blair county.)		....	....	....	....	....	....	1	....		1	
186 Greensburg (part), Westmoreland county (Westmoreland Water Co. Hempfield township.)	....			....	....	....	....	....	....	....	....	....	....	
187 Green Tree, Allegheny county (So. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....	....	
188 Greenville, Mercer county, ...	....	83 Greenville Water Co., ...		....	....	....	....	....	....	....	....	1	1	
189 Halifax, Dauphin county, ...	....	84 Halifax Water Co., ...		....	....	....	....	....	....	1	1		2	
190 Hallam, York county (Hallam Water Co.)	..			....	....	....	....	....	....	....	....	....	....	
191 Hallstead, Susquehanna county, ...	....	85 Hallstead Water Co. (also supplies Great Bend, Susquehanna county.)		....	....	....	...	1	....	....	....		1	
			16 Hall, W. C. (Chinchilla Village, South Abington township, Lackawanna county.)	....	....	....	....	....	....	....	1		1	
192 Hamburg, Berks county (Windsor Water Co.)	....			....	....	....	....	....	....	....	....	....	....	
193 Hamilton township, McKean county (J. G. Curtis Leather Co.)	....			....	....	....	....	....	....	....	....			
194 Hamilton township, Monroe county (See also Blue Mountain Cons. Water Co.)	....	86 Hamilton Water Co., ...		1	....	....	....	....	....	....	....		1	
195 Hampton township, Allegheny county (Allison Park Water Co.) (John E. Wyland.)	....			....	....	....	....	....	....	....	....			
196 Hanover, York county, ...	....	87 Hanover and McSherrystown Water Co. (also supply McSherrystown borough, Adams county and Penn township, York county.)		....	....	....	1	....	....	....	....		1	
197 Hanover township, Lehigh county (Bethlehem City Water Co.)	....			....	....	....	....	....	....	....	....			
198 Hanover township, Luzerne county (Spring Brook Water Supply Co.)	...			....	....	....	...	....	...	....	....			

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
199 Harmar township, Allegheny county (Tarentum Water Co.)	....			....	....	....	....	....	....	....	....	...
200 Harris township, Centre county (Boalsburg Water Co.) (State College Water Co.)	....			....	....	....	....	....	....	....	....	...
201 Harrisburg (city), Dauphin county (also bought East Mere Water Co.)	39			....	....	....	....	1	....	....	....	1
202 Harrison township, Allegheny county (Natrona Water Co.) (Tarentum Water Co.)	....			....	....	....	....	....	....	....	....	....
203 Haverford township, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	...
204 Hays, Allegheny county (South Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....
205 Haysville, Allegheny county, ...	....	88 Haysville Water Co. (Inc. Jan. 28, 1898, for Aleppo township Allegheny county and Osborne. Also supplies Haysville, Inc. from Aleppo in 1902, and Glenfield, Inc. in 1876.)		....	....	....	....	....	1	....	1	2
206 Hazleton (city), Luzerne county. (See also Diamond Water Co. of Hazleton.)	....	89 Hazleton Water Co. (Also supplies Beaver Meadow borough, Carbon county and Jeansville (P. O.) Village, Hazle township, Luzerne Co.)		....	....	....	1	....	....	....	....	1
207 Hazle township, Luzerne county. (See also Hazleton Water Co. and Milnesville Water Co.)	...	90 Hazle township Water Co., ...		....	....	....	....	....	....	1	....	1
208 Hegins township, Schuylkill county,	....	91 Hegins Water Co., ...		....	....	....	....	....	....	....	1	1
209 Heidelberg, Allegheny county (So. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....

210 Heidelberg township, Lebanon county.	....	.....	17 Heidelberg Water Co. (of Schaefferstown Village.)	....	....	....	1	....	....	....	....	1
211 Hellam township, York county, ...	....	92 Hellam Water Co. (Inc. Oct. 11, 1906) (Also supplies Hallam, Inc. May 25, 1908.)	.....	....	....	....	....	1	....	....	....	1
212 Hempfield township, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....	.....	.....	....	....	....	....	....	....	....	....	....
Hershey Village, Derry township, Dauphin county.	....	93 Hershey Water Co. (First permit issued to M. S. Hershey.)	.....	....	....	1	....	....	....	....	1	1
213 Hickory township, Mercer county (Sharon Water Works Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
214 Hilltown township, Bucks county,	....	91 Hilltown Water Co., ...	.....	....	....	....	....	....	1	....	....	1
			18 Hock, Coombe and Brumm (Norwegian township, Village of Mar-Lin, Schuylkill county.)	....	....	....	....	....	....	....	2	2
215 Homestead, Allegheny county, ...	40	.....	.....	....	....	....	....	....	....	1	1	2
			Homoeopathic State Hospital for the Insane (Rittersville Village, Hanover township, Lehigh county) (Supply from Bethlehem City Water Company.)									
216 Honesdale, Wayne county, ...	....	95 Honesdale Consolidated Water Co., ...	.....	....	....	....	1	....	....	....	....	1
217 Hooversville, Somerset county, ...	....	96 Hooversville Water Co., ...	.....	....	....	....	....	....	....	1	....	1
218 Hopbottom, Susquehanna county, ..	....	97 Hopbottom Water Co., ...	.....	....	....	....	....	....	....	....	1	1
			19 Horner, H. M. (Summerdale Village, E. Pennsboro township, Cumberland county.)	....	....	....	1	....	....	....	....	1
219 Houtzdale, Clearfield county, ...	....	98 Houtzdale Water Co., ...	.....	....	....	1	....	....	....	....	....	1
220 Hughestown, Luzerne county (Spring Brook Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
221 Hummelstown, Dauphin county, ...	....	99 Hummelstown Consolidated Water Co., ..	.....	....	1	1	1	....	....	....	....	3

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
222 Huntingdon, Huntnigdon county (See Penna. Ind. Ref.)	....	100 Huntingdon Water Supply Co.,		....	....	....	2	....	....	....	....	2
223 Hyndman, Bedford county,	....	101 Hyndman Water Co.,		....	....	....	....	....	1	1	....	2
224 Indiana, Indiana county (Clymer Water Co. of Indiana.)	....			....	....	....	....	....	....	....	....	
225 Ingram, Allegheny county (South Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	..
226 Irwin, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....			....	....	....	....	....	....	....	....	...
		102 Jacks Mountain Water Co. (Mapleton, Huntingdon county.)		1	....	....	....	....	....	....	....	1
227 Jackson township, Cambria county (Nant-y-Glo Water Co., uninc.)	....			....	....	....	....	....	....	....	....	...
228 Jackson township, Lebanon county (Myerstown Water Co.)	....			....	....	....	....	....	....	....	....	...
229 Jeannette, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....			....	....	....	....	....	....	....	....	....
Jeansville, Hazle township, Luzerne county (Hazleton Water Co.)	....			....	....	....	....	....	....	....	....	....
230 Jefferson township, Allegheny county (South Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	...
231 Jenkins township, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	...
232 Jenkintown, Montgomery county,	....	103 Jenkintown Water Co.,		....	....	....	....	1	....	....	....	1

233 Jenner township, Somerset county (Consolidation Coal Co.)	....			....	....	....	....	....	....	....	....	....	....
234 Jersey Shore, Lycoming county,	....	104 Jersey Shore Water Co.,		....	....	....	....	....	2	....	1	3	
235 Johnsonburg, Elk county. (See also W. E. Zierdon.)	....	105 Johnsonburg Water Co.,		....	....	....	....	....	....	....	1	1	
236 Johnstown (city), Cambria county. (See also Jerry Alwine, and Morrellville and Cambria Boro Water Co.)	....	106 Johnstown Water Co. (Also supplies Dale, Ferndale and Westmont boroughs, and Stony Creek township, Cambria county.)		....	....	1	....	....	....	....	....		
			20 Jones and Laughlin Steel Co. (Woodlawn, Beaver county.)	....	....	1	....	....	....	....	....	1	
		107 Josephine Water Co. (Burrell township, Indiana county.)		....	....	....	1	....	....	....	....	1	
237 Juniata, Blair county,	41			....	....	....	....	1	1	....	....	2	
		108 Kensington Water Co. (Supplies Arnold, New Kensington, and Parnassus, Westmoreland county.)		....	....	....	....	....	....	1	....	1	
238 Kingston, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	
239 Kingston township, Luzerne county (Shaver Bros. Water Works) (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	
240 Kittanning, Armstrong county (Citizens Water Co. of Kittanning.)	....			....	....	....	....	....	....	....	....	....	
241 Knoxville, Allegheny county (So. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....	
242 Knoxville, Tioga county,	42			....	....	....	1	....	....	....	....	1	
Koppel, Town of, Big Beaver township, Beaver county.	....	109 Koppel Water Co.,		....	....	....	....	....	1	....	....	1	
Kulpmont, Town of, Mt. Carmel township, Northumberland county.	....	110 Kulpmont Water Co.,		....	....	....	....	....	1	....	....	1	
243 Lackawanna township, Lackawanna county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	
244 Laflin, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
245 Lancaster (city), Lancaster county (Owns municipal distribution system; also supplies Manheim Township Water Co.) (See also Lancaster Water Filtration Co. which filters supply.)	43			....	....	....	....	....	1	....	....	1
		111 Lancaster Water Filtration Co.,		....	....	....	....	....	....	1	....	1
246 Lansdale, Montgomery county,	....	112 Lansdale Water Co.,		....	....	....	....	....	1	1	....	2
247 Lansdowne, Delaware county (Springfield Water Co.)	....			....	...	....	....	....	....	....	....	....
248 Lansford, Carbon county (Panther Valley Water Co.)	....			....	....	....	....	....	....	....	....	...
249 Laporte, Sullivan county (Mokoma Spring Water Co.)	....			....	....	....	....	....	....	....	....	....
250 Larksville, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	...
251 Latrobe, Westmoreland county,	....	113 Latrobe Water Co.,		....	....	....	....	1	....	1	....	2
252 Laurel Run, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
253 Lebanon (city), Lebanon county,..	44			....	2	....	1	1	....	....	1	5
		114 Lebanon Valley Consolidated Water Supply Co. (North and South Lebanon townships, Lebanon county.)		....	....	....	1	2	....	....	....	3
254 Leechburg, Armstrong county (Apollo Water Works Co.)	....			....	....	....	....	....	....	....	....	....
		115 Lehigh Water Co. (Easton, Northampton county.)		....	....	....	....	1	....	1	....	2

255 Lemoyne, Cumberland county (Riverton Cons. Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
		116 Lenni Heights Water Co. (Middletown township, Delaware county.)	....	....	....	....	....	....	....	1	....	
256 Ligonier, Westmoreland county, ...	45	....	....	....	....	....	....	....	1	....	....	1
257 Lock Haven, Clinton county, ...	46	....	....	....	....	....	....	....	1	....	....	1
258 Logan township, Blair county (Green Hill Water Co.) (Roselawn Water Co.)	....	....	....	....	....	....	....	....	....	....	....	
		117 Londonderry Water Co. (Palmyra, Lebanon county.)	....	....	....	....	1	....	....	....	....	1
259 Lower Allen township, Cumberland county (Riverton Cons. Water Co.)	....	....	....	....	....	....	....	....	....	....	....	
260 Lower Alsace township, Berks county (Mt. Penn Suburban Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
261 Lower Chichester township, Delaware county (New Chester Water Co.)	....	....	....	....	....	....	....	....	....	....	....	..
262 Lower Gwynedd township, Montgomery county.	....	118 Lower Gwynedd Water Co., ...	....	....	....	....	....	....	....	1	....	1
263 Lower Heidelberg township, Berks county (State Asylum for Chronic Insane of Penna., Wernersville P. O.)	...	....	....	....	...	...	....	....	....	....	....	
264 Lower Merion township, Montgomery county (Springfield Water Co.)	....	....	....	....	....	....	....	....	....	....	....	..
265 Lower Nazareth township, Northampton county (Blue Mountain Cons. Water Co.)	....	....	....	....	....	....	....	....	....	....	....	....
266 Lower Saucon township, Northampton county (Bethlehem City Water Co.)	...	....	....	...	....	....	....	....	....	...	...	...
267 Lower Towamensing township, Carbon county (Palmer Water Co.)	....	....	....	....	....	....	....	....	....	...	...	...
Ludlow, Hamilton township, McKean county (J. G. Curtis Leather Co.)	...	....	....	....	...	....	....	...	....	....	....	..

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
268 Luzerne, Luzerne county (Spring Brook Water Supply Co.)	...	.....	.....	....	....	....	....	....	....	....	....	....
			21 Luzerne County Central Poor District Hospital for Insane and Almshouse (at Retreat, Newport township.)	....	....	1	1	....	....	....	....	2
269 Lykens, Dauphin county, ...	....	119 Lykens Water Co. (Also supplies Wiconisco township, Dauphin county.)	.....	....	....	....	....	....	...	1	....	1
270 McKeesport (city), Allegheny county	47	.....	.....	....	1	1	....	....	....	....	....	2
271 McKees Rocks, Allegheny county (Ohio Valley Water Co.)	....	.....	.....	....	....	....	....	....	....	....	...	...
272 McSherrystown, Adams county (Hanover and McSherrystown Water Co.)	....	.....	.....	....	....	...	....	....	....	....	....	..
273 Macungie, Lehigh county, ...	48	.....	.....	....	....	....	1	....	....	....	....	1
Madera (P. O.) Village, Bigler township, Clearfield county.	....	120 Madera Water Co., ...	.....	....	....	1	....	....	....	....	....	
274 Mahanoy City (borough), Schuylkill county.	....	121 Mahanoy City Water Co. (See also Mahanoy, Delano, and East Union townships, Schuylkill county.)	.....	....	....	....	....	1	1	....	1	3
275 Mahanoy township, Schuylkill county (Anthracite Water Co.) (Mahanoy City Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	..
276 Mahoning township, Montour county (State Hospital for the Insane, near Danville.)	...	.....	.....	....	...	....	....	....	....	....	....	...

277 Manchester township, York county (York Water Co.)	....			....	....	....	....	....	....	....	....	....	....	....
278 Manheim township, Lancaster county	....	122 Manheim Township Water Co. (Supplied by Lancaster City, Lancaster county.)		....	....	....	....	....	....	1	....	1
279 Manor, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....			....	....	....	....	....	....	....	....	....	....	....
280 Mapleton, Huntingdon county (Jacks Mountain Water Co.)	....			....	....	....	....	....	....	....	....	....		
281 Marcus Hook, Delaware county (Chichester Water Co.)	....			....	....	....	....	....	....	....	....	....	....	....
282 Marianna, Washington county (Inc. in 1910.)	....	123 Marianna Water Co. (West Bethlehem township, Washington county.)		....	....	....	1	....	1	2	....	4
		124 Marie Water Co. (Black Lick township, Cambria county.)		....	....	....	1	....	....	....	....	1
283 Marietta, Lancaster county, ...	....	125 Marietta Gravity Water Co., ...		....	....	....	....	1	....	....	....	1
284 Marion Center, Indiana county (J. H. Rochester of Marion Center Water Co., unine.)	....			....	....	....	....	....	....	....	....	....	....	....
Mar-Lin Village, Norwegian township, Schuylkill county. (See also Hock, Coombe & Brumm.)	....	126 Mar-Lin Water Co., ...		....	....	....	....	....	....	....	1	1
285 Marple township, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....	....	....
286 Mars, Butler county, ...	49			....	....	....	1	....	....	....	....	1
		127 Martindale Water Co. (Portage borough and Portage township, Cambria county.)		....	...	....	1	....	...	....	....	1
287 Marysville, Perry county, ...	....	128 Marysville Water Co., ...		....	....	....	....	....	....	2	....	2
288 Masontown, Fayette county, ...	50			....	....	....	....	1	1	....	....	2
289 Matamoras, Pike county (Inc. 1905.)	....	129 Matamoras Citibzens Water Co. (Inc. June 17, 1903, for Westfall township, Pike county.)		....	...	1	....	...	...	....	....	
290 Mauch Chunk, Carbon county. (See also Upper Mauch Chunk Water Co.)	....	130 Mauch Chunk Water Co. (also supplied East Mauch Chunk, Carbon county.)		....	...	....	....	....	....	1	1	2

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
291 Mauch Chunk township, Carbon county (Panther Valley Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		131 Mauch Chunk Township Water Co. (Permit* 1906. Sold to Panther Valley Water Co. in 1907, which see.)	.....	*	....	....	....	....	....	....	....	*
292 Mechanicsburg, Cumberland county,	....	132 Mechanicsburg Gas and Water Co., ...	.....	1	....	1	....	....	....	....	....	2
293 Mercersburg, Franklin county, ...	....	133 Mercersburg Water Co., ...	.....	....	....	....	....	....	....	....	1	1
294 Meyersdale, Somerset county (Sand Spring Water Co. of Meyersdale.)	....	.....	.....	....	....	....	....	....	....	....	....	....
295 Middle Paxton township, Dauphin county (Dauphin Cons. Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
296 Middleport, Schuylkill county, ...	....	134 Middleport Water Co., ...	.....	....	....	....	....	....	....	1	....	1
297 Middletown, Dauphin county, ...	....	135 Middletown and Swatara Consolidated Water Co. (Also supplies Royalton, Dauphin county.)	.....	....	....	....	1	....	....	....	....	1
298 Middletown township, Delaware county (Glen Mills Schools, Girls' Department) (Lenni Heights Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
299 Midland, Beaver county, ...	....	136 Midland Water Co., ...	.....	....	....	....	....	....	....	....	1	1
300 Mifflin township, Allegheny county (South Pittsburgh Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....

301 Milford township, Juniata county (Port Royal Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	....
			22 Miller, F. C. (for Pocono Pines, Tobyhanna township, Monroe county.)	....	....	....	....	....	....	1	....	1
302 Millersburg, Dauphin county,	....	137 Millersburg Home Water Co.,		....	....	....	1	....	....	....	....	1
Milnesville Village, Hazle township, Luzerne county.	....	138 Milnesville Water Co.,		....	....	....	1	....	....	....	....	1
303 Miners Mills, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
304 Minersville, Schuylkill county,	....	139 Minersville Water Co. (Also supplies Cass and New Castle townships, Schuylkill county.)		....	....	1	....	....	....	....	....	1
		140 Mokoma Spring Water Co. (Laporte, Sullivan county.)		....	....	....	....	1	....	....	....	1
305 Monessen, Westmoreland county,	....	141 Monessen Water Co. (Bought Charleroi and Donora Water Cos.—Aug. 15, 1912. Now Tri-Cities Water Co.)		....	....	....	....	1	....	1	....	2
306 Monroe, Clarion county (Towanda Water Co.)	....			....	....	....	....	....	....	....	....	....
307 Monroe township, Snyder county (J. Calvin Boyer.)	....			....	....	....	....	....	....	....	....	....
308 Montgomery, Lycoming county,	....	142 Montgomery Water Co.,		....	....	....	....	....	....	1	....	1
309 Montgomery township, Montgomery county (North Wales Water Co.)	....			....	....	....	....	....	....	....	....	....
		143 Moore Water Co. (Plum township, Allegheny county.)		....	....	....	....	1	....	....	....	1
310 Moosic, Lackawanna county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
311 Moreland township, Montgomery county. (See also Springfield Cons. Water Co.)	....	144 Moreland Spring Water Co.,		....	....	....	....	2	....	1	1	4

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
Morganza, Cecil township, Washington county. (See Penna. Training School.)	....			....	....	....	....	....	....	....	....	....
		145 Morrelleville and Cambria Borough Water Co. (Johnstown, Cambria county.)		....	....	....	....	1	....	1	....	2
		146 Moss Glen Water Co. (Schuylkill township, Schuylkill county.)		....	....	....	....	....	....	1	....	1
		147 Mountain Water Co. (Upper Milford township, Lehigh county, and Emaus, extension of, Lehigh county.)		....	....	....	....	....	1	....	....	1
312 Mount Carmel township, Northumberland county (Kulpmont Water Co.)	....			....	....	....	....	....	....	....	....	....
313 Mount Joy township, Lancaster Co. (Florin Water Co.)	....			....	....	....	....	....	....	....	....	....
314 Mount Oliver, Allegheny Co. (S. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....
315 Mount Penn, Berks Co.,	....	148 Mount Penn Suburban Water Co. (Also supplies Exeter and Lower Alsace townships, Berks county.)		....	....	....	....	....	....	1	....	1
316 Mount Union, Huntingdon county,	....	149 Mount Union Water Co. (Also supplies Shirley township, Huntingdon county.		....	....	1	....	....	....	1	....	2
317 Mountville, Lancaster county, ...	51			....	....	1	....	....	....	....	1	2
318 Mublenberg township, Berks county (Reading Suburban Water Co.)	....			....	....	....	....	....	....	....	....	....
319 Muncy, Lycoming county,	....	150 Muncy Water Supply Co.,		....	....	....	....	....	1	....	....	1

Myerstown (P. O.) village (Jackson township) Lebanon county.	....	151 Myerstown Water Co.,		....	....	....	1	1	....	....	....		2
320 Nanticoke, Luzerne county (Spring Brook Water Supply Co.)	...			....	....	....	....	....	....	....	....		....
Nant-y-Glo (Black Lick and Jackson townships, Cambria county)	....		23 Nant-y-Glo Water Co., (Unincorporated.)	....	....	1	....	....	....	....	....		1
321 Narberth, Montgomery county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....		....
		152 Natrona Water Co. (Harrison township, Allegheny county.)		....	....	1	....	....	....	....	....		1
322 Nazareth, Northampton county (Blue Mountain Consolidated Water Co.)	....			....	....	....	....	....	....	....	....		....
323 Nescopeck, Luzerne county, ...	....	153 Nescopeck Water Supply Co.,		....	....	....	1	....	....	....	....		1
324 Neville township, Allegheny county (Island) (Ohio Valley Water Co.)	....			....	....	....	....	....	....	....	....		....
325 New Bethlehem, Clarion county (Citizens Water Co. of New Bethlehem.)	...			....	....	....	....	....	....	....	....		....
New Bloomfield, Perry county (Bloomfield Water and Sewer Co.)	....			....	....	....	....	....	....	....	....		....
326 New Brighton, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	....		....
327 New Castle (city), Lawrence county (City of New Castle Water Co.)	....			....	....	....	....	....	....	....	....		....
328 New Castle township, Schuylkill county (Minersville Water Co.)	....			....	....	..	....	....	....	....	....		....
		154 New Chester Water Co. (Supplies Chester city, Upland borough and Lower Chichester township, Delaware county.)		....	....	3	1	....	....	3	....		4
329 New Cumberland, Cumberland county (Riverton Consolidated Water Co.)	....			...	....	...	....	....	....	....	....		....
330 New Kensington, Westmoreland county (Kensington Water Co.)	....			....	....	....	....	....	....	....	....		....
331 New Oxford, Adams Co., ...	52			....	....	....	....	....	....	1	1		2

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
332 Newport, Perry Co.,	....	155 Newport Home Water Co. (Also supplies Oliver township, Perry county.)		....	....	....	1	....	....	....	....	1
333 Newport township, Luzerne county (Luzerne county Central Poor District) (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
334 Nicholson, Wyoming county,	....	156 Nicholson Water Co.,		....	....	....	....	....	....	....	2	2
335 Nippenose township, Lycoming county.	....	157 Nippenose Water Co.,		....	....	....	....	....	1	....	....	1
336 Norristown, Montgomery county,	....	158 Norristown Insurance and Water Co. (Also supplies Bridgeport borough and Plymouth township, Montgomery county.)		....	....	....	....	....	1	....	....	1
337 Northampton, Northampton county (Clear Springs Water Co.)	....			....	....	....	....	....	....	....	....	....
338 Northampton Heights, Northampton county (Bethlehem City Water Co.)	....			....	....	....	....	....	....	....	....	....
339 North Annville township, Lebanon county (see also Annville Water Co.)	....	159 North Annville Water Supply Co.,		....	....	....	....	1	....	....	....	1
340 North Braddock, Allegheny county (Pennsylvania Water Co.)	....			....	....	....	....	....	....	....	....	....
341 North Catasauqua, Northampton county (Clear Springs Water Co.)	....			....	....	....	....	....	....	....	....	....
342 North Charleroi, Washington county (Charleroi Water Co.)	....			....	....	....	....	....	....	....	....	....

343 North Cornwall township, Lebanon county.	....	160 North Cornwall Water Supply Co.,	.....	....	....	....	....	1	....	....	....	1
344 North Coventry township, Chester county (Pottstown Gas and Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
345 North East, Erie county, ...	53	.....	.....	1	....	1	....	....	....	1	....	3
		Northern Cambria Water Co. (Barnesboro Water Co. and Spangler Water Co. merged with this Co. in 1913. See former Co. for permit.) (Supplies Spangler Borough and Susquehanna township, Cambria county. Distributing system in Barnesboro sold to borough in 1913.)	....	....	....	....	....	...	....	....	....	....
346 North Huntingdon township, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....	.....	.....	....	....	....	....	....	....	....	....	....
347 North Irwin township, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....	.....	.....	....	....	....	....	....	....	....	....	....
348 North Lebanon township, Lebanon county (Lebanon Valley Consolidated Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
349 North Londonderry township, Lebanon county (Gravel Hill Water Supply Co.)	...	.....	.....	....	....	....	....	....	....	....	....	....
350 North Manheim township, Schuylkill county.	....	161 North Manheim Water Co., ...	.....	....	....	....	....	....	1	...	....	1
351 North Strabane township, Washington county.	....	162 North Strabane Water Co. (Supplies Canonsburg and Cecil township, Washington county.)	.....	....	....	....	....	....	....	1	....	1
352 Northumberland, Northumberland county.	....	163 Northumberland Water Co. (Also supplies Point township, Northumberland county.)	.....	....	....	....	....	....	....	1	....	1
353 North Versailles township, Allegheny county (East McKeesport Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	...
354 North Wales, Montgomery county,	....	164 North Wales Water Co. (Also supplies Montgomery township, Montgomery county.)	.....	....	....	....	....	....	....	1	...	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
355 Norwegian township, Schuylkill county (Hock, Coombe & Brumm) Mar-Lin Water Co.) (Penn Land Co.)	....			....	....	....	....	....	....	....	....	....
356 Norwich township, McKean county (Crosby Gas Co.)	....			....	....	....	....	....	....	....	....	....
357 Norwood, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....
Oak Lane, Philadelphia, (Springfield Consolidated Water Co.)	....			....	....	....	....	....	....	....	....	....
358 Oakmont, Allegheny county (Suburban Water Co. of Allegheny county, Pa.)	....			....	....	....	....	....	....	....	....	....
		165 Ogontz Water Co. (Cheltenham township, Montgomery county.)		....	....	....	....	1	....	....	....	1
		166 Ohio Valley Water Co. (Supplies Avalon, Ben Avon, Bellevue, Emsworth, McKees Rocks and Westview boroughs, and Neville, Ross, and Stowe townships, Allegheny county.)		....	....	....	1	....	1	....	....	2
359 Old Forge, Lackawanua county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
360 Oliver township, Perry county (Newport Home Water Co.)	....			....	....	....	....	....	....	....	....	....
361 Orbisonia, Huntingdon county, ...	....		24 Orbisonia Water Co. (Not incorporated.) (Orbisonia and Rockhill, Huntingdon county.)	...	....	1	....	....	....	...	....	1

362 Osborne, Allegheny county (Hays-ville Water Co.)	....			....	....	....	....	....	....	....	....	....	....
Overbrook, Philadelphia (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....	....
363 Oxford, Chester county,	54			....	....	....	....	2	....	....	....	2	
364 Paint, Somerset county (Windber Water and Power Co.)	....			....	....	....	....	....	....	....	....	....	....
365 Paint township, Somerset county (Windber Water and Power Co.)	....			....	....	....	....	....	....	....	....	....	....
		167 Palmer Water Co. (Supplies Lower Towamensing township, Carbon county, and Palmerton borough, incorporated out of this township October 14, 1912.)		....	....	....	....	....	....	3	....	3	
366 Palmerton, Carbon county (Palmer Water Co.)	....			....	....	....	....	....	....	....	....	....	....
		168 Panther Valley Water Co. (Supplies Lansford borough and Mauch Chunk township, Carbon county and Coaldale borough and Rahn township, Schuylkill county; also other districts in these counties. In 1907 purchased Mauch Chunk township Water Co., that received permit* in 1906.		*1	....	....	....	1	1	....	....	3	
367 Parker (city), Armstrong county,	....	169 Parker City Water Co.,		....	....	....	....	....	1	....	....	1	
368 Parkesburg, Chester county,	....	170 Parkesburg Water Co.,		....	....	1	....	....	....	....	....	1	
369 Parnassus, Westmoreland county (Kensington Water Co.)	....			....	....	....	....	....	....	....	....	....	....
370 Parsons, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	....
371 Patterson Heights, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	....	....	....
372 Patton township, Allegheny county (Pennsylvania Water Co.)	....			....	....	....	....	....	....	....	....	....	....
Paxtang (P. O.) village, Swatara township, Dauphin county.	....	171 Paxtang Consolidated Water Co.,		....	....	1	2	....	....	....	....	3	
373 Pen Argyl, Northampton county (Blue Mountain Consolidated Water Co.)	...			....	....	....	....	....	...	....	....	....	....

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
374 Penbrook, Dauphin county (Extension Water Co. of Penbrook.)	....	.....	.....	....	....	....	....	....	....	....	....	....
375 Penn, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....	.....	.....	....	....	....	....	....	....	....	....	....
			25 Penn Land Co. (Norwegian township, Schuylkill county.)	....	....	....	....	....	1	1	....	2
376 Pennsburg, Montgomery county, ...	....	172 Pennsburg Water Co., ...	.....	....	....	....	....	....	1	....	....	1
			26 Pennsylvania Industrial Reformatory (Smithfield township, near Huntingdon, Huntingdon county.)	....	....	....	....	1	....	1	....	2
			27 Pennsylvania Training School (Morganza, Cecil township, Washington county.)	....	....	1	....	....	....	....	....	1
		173 Pennsylvania Water Co. (Supplies in Allegheny county Braddock, Patton, Penn and Wilkins townships, and E. Pittsburgh, Edgewood, N. Braddock, Pitcairn, Rankin, Swissvale, Turtle Creek, Wilkinsburg and Wilmerding boroughs and Pittsburgh, 13th ward. Also Trafford City borough, in Westmoreland county.)	.....	....	....	....	1	1	....	....	....	2
377 Penn township, Allegheny county (Pennsylvania Water Co.) (Unity Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....

378 Penn township, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....			....	....	....	....	....	....	....	....	....	....
379 Penn township, York county (Hanover and McSherrystown Water Co.)	....			....	....	....	....	....	....	....	....	....	....
380 Perkasie, Bucks county,	....	174 Perkasie Water Supply Co.,		....	....	....	1	....	2	....	....	3	
381 Perry township, Snyder county (J. Calvin Boyer.)	....			....	....	....	....	....	....	....	....	....	
382 Philadelphia (city), (Jas. S. Williams for Somerton) (Springfield Consolidated Water Co. for Oak Lane and Springfield Water Co. for Overbrook.)	....			....	....	....	....	....	....	....	....	....	
383 Phoenixville, Chester county (See also Schuylkill township, Chester county and Upper Providence township, Montgomery county.)	55			....	....	....	....	....	2	1	....	3	
384 Pitcairn, Allegheny county (Pennsylvania Water Co.)	....			....	....	....	....	....	....	....	....	....	
385 Pittsburgh (city), Allegheny county (See also Pennsylvania Water Co. for 13th ward and So. Pittsburgh Water Co. for Sheraden (old 43rd ward) and 38th and 42nd wards and W. Liberty Dist.)	56			....	....	1	....	....	....	1	....	2	
			28 Pittsburgh Coal Co. (Van Meter, Rostraver township, Westmoreland county.)	....	....	...	....	....	....	....	1	1	
386 Pittston (city), Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	
387 Pittston township, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	
388 Plainfield township, Northampton county (See also Blue Mountain Consolidated Water Co.)	...	175 Plainfield Water Co.,		....	....	....	....	....	....	...	1	1	
389 Plains township, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	
		176 Pleasant Gap Water Supply Co. (Spring township, Centre county.)		....	...	...	....	....	1	....	....	1	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
390 Pleasantville, Venango county, ...	57	.....	.....	....	....	....	1	....	....	....	....	1
391 Plum township, Allegheny county (Moore Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
392 Plymouth, Luzerne county (Spring Brook Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
393 Plymouth township, Luzerne county (Spring Brook Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
394 Plymouth township, Montgomery county (Norristown Insurance and Water Co.) (Springfield Consolidated Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
Pocono Pines, Tobyhanna township, Monroe county (F. C. Miller.)	....	.....	.....	....	....	....	....	....	....	....	....	
395 Point township, Northumberland county (Northumberland Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
396 Polk, Venango county (State Institution for Feeble-Minded of Western Pennsylvania.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		177 Pompeii Water Co. (Washington township, Northampton county.)	.....	....	....	....	....	....	....	1	....	1
397 Portage, Cambria county (Martindale Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
398 Portage township, Cambria county (Bens Creek Water Co.) (Martindale Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
399 Port Allegany, McKean county, ..	....	178 Port Allegany Water Co., ...	.....	....	....	....	....	....	1	....	....	1

400 Portland, Northampton county, ..	....	179 Portland Water Co. (Also supplies Upper Mt. Bethel township, Northampton county.)	.....	....	1	....	....	1	....	...	....	2
Port Matilda (P. O.) village, (Worth township, Centre county)	....	180 Port Matilda Water Co.,	.....	....	....	....	1	....	....	....	....	1
401 Port Royal, Juniata county, ...	....	181 Port Royal Water Supply Co. (Also supplies Milford and Turbett townships, Juniata county.)	.....	....	....	....	....	1	1	....	....	2
402 Pottstown, Montgomery county, ...	...	182 Pottstown Gas and Water Co. (Also supplies No. Coventry township, Chester county, and W. Pottsgrove township, Montgomery county.)	.....	....	....	1	....	....	....	....	...	1
403 Pringle township, Luzerne county (Spring Brook Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
404 Prospect Park, Delaware county (Springfield Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
405 Punxsutawney, Jefferson county, ..	....	183 Punxsutawney Water Co. (Also supplies Big Run, Jefferson county.)	.....	....	....	....	1	....	....	....	....	1
406 Quarryville, Lancaster county, ...	....	184 Quarryville Water Co.,	.....	....	....	....	....	2	1	....	....	3
407 Radnor township, Delaware county (Springfield Consolidated Water Co.)	....	.....	.....	....	....	...	....	....	....	....	....	....
408 Rahn township, Schuylkill county (Panther Valley Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
409 Ramey, Clearfield county, ...	....	185 Ramey Water Co. (Also supplies Bigler township, Clearfield county.)	.....	....	....	....	1	....	....	....	....	1
410 Rankin, Allegheny county (Pennsylvania Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
411 Rayburn township, Armstrong county (Citizens Water Co. of Kittanning.)	....	.....	.....	....	....	....	....	....	....	....	...	....
412 Reade township, Cambria county (Blandburg Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
413 Reading (city), Berks county, ...	58	.....	.....	....	....	....	2	....	....	....	....	2
		186 Reading Suburban Water Co. (Muhlenberg township, Berks county.)	.....	....	....	1	....	....	1	....	....	2
			29 Rebok, George A. (Tuscarora township, Perry county.)	....	....	....	....	....	....	....	1	1
414 Red Hill, Montgomery county, ...	....	187 Red Hill Water Co., ...	.....	....	....	....	....	....	1	....	....	1
415 Red Lion, York county, ...	....	188 Red Lion Water Co., ...	.....	....	....	....	....	....	1	1	....	2
416 Reilly township, Schuylkill county (Blackwood Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		189 Reliance Water Co. (Franconia township, Montgomery county.)	.....	....	....	....	....	....	1	....	....	1
417 Renovo, Clinton county, ...	59	.....	.....	....	....	....	....	....	1	....	....	1
Retreat (P. O.), Newport township, Luzerne county (Luzerne county Central Poor District.)	....	.....	.....	....	....	....	....	....	....	....	....	....
418 Reynoldsville, Jefferson county, ...	....	190 Reynoldsville Water Co. (Also supplies W. Reynoldsville borough and Winslow township, Jefferson county.)	.....	....	....	....	....	....	....	1	....	1
		191 Rheems Water Co. (W. Donegal township, Lancaster county.)	.....	....	....	....	....	....	1	....	....	1
419 Richland township, Cambria county (See also Windber Water and Power Co.)	....	192 Richland township Water Co., ...	.....	....	....	....	....	....	....	....	1	1
420 Richland township, Clarion county (Foxburg Water Works Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....

421 Ridgway, Elk county,	60			....	1	1	1	....	....	....	....	3
422 Ridley Park, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....
423 Ridley township, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....
		193 Ridley Water Co. (Eddystone, Delaware county.)		....	....	1	1	....	....	....	....	2
424 Rimersburg, Clarion county,	61			....	....	....	....	1	....	....	1	2
425 Ringtown, Schuylkill county,	....	194 Ringtown Spring Water Supply Co.,		....	....	....	....	1	....	1	....	2
Rittersville Village, Hanover township, Lehigh county (Homeopathic State Hospital for the Insane, supplied by Bethlehem City Water Co.)	....			....	....	....	....	....	....	....	....	....
		195 Riverton Consolidated Water Co. (Supplies Camp Hill, Lemoyne, New Cumberland and Wormleysburg boroughs and E. Pennsboro and Lower Allen townships, Cumberland county, and Fairview township, York county.)		....	....	3	1	....	...	....	....	4
		196 Roaring Creek Water Co. (Shamokin borough and Coal township, Northumberland county.)		....	....	....	....	....	...	1	....	1
426 Robinson township, Allegheny county (So. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....
427 Rochester, Beaver county (Beaver Valley Water Co.)	....			....	....	....	...	...	....	...	....	....
			39 Rochester, J. H., of Marion Center Water Co., unincorporated. (Marion Center, Indiana county.)	....	....	....	....	....	1	....	....	1
428 Rochester township, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	....	....
429 Rockhill, Huntingdon county (Orbisonia Water Co.)	....			....	....	....	....	....	....	....	....	....
		197 Rock Hill Water Co. (Telford, Bucks county.)		....	....	....	....	....	1	....	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905 -0f	1907	1908	1909	1910	1911	1912	1913	To-tal.
430 Rockledge, Montgomery county (Springfield Consolidated Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		198 Roselawn Water Co. (Logan township, Blair county.)	.....	....	....	....	....	1	1	....	....	2
431 Roseto, Northampton county (Bangor Water Co.)	...	.....	.....	....	....	....	....	....	....	....	....	....
432 Rose township, Jefferson county (Brookville Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
433 Ross township, Allegheny county (Ohio Valley Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
434 Ross township, Monroe county (Blue Mountain Consolidated Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
435 Rostraver township, Westmoreland county (Monessen Water Co.) (Pittsburgh Coal Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
436 Roulette township, Potter county,..	....	199 Roulette Water Co., ...	.....	....	....	1	....	....	....	....	....	1
437 Royalton, Dauphin county (Middletown and Swatara Consolidated Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
438 Rural Valley, ...	62	.....	.....	....	....	....	....	1	....	....	....	1
		200 Rutherford Heights Water Supply Co. (Swatara township, Dauphin county.)	.....	....	2	1	1	....	....	....	....	4
439 Saegertown, Crawford county, ...	63	.....	.....	....	....	....	....	....	2	....	....	2
440 St. Clair, Allegheny county (So. Pittsburgh Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....

441 St. Marys, Elk county,	....	201 St. Marys Water Co.,	....	....	....	1	....	....	....	....	....	1
442 Salem township, Luzerne county (W. Salem Water Supply Co.)	....		....	....	....	....	....	....	....	....	....	....
443 Salisbury township, Lehigh county (Bethlehem City Water Co.)	....		....	....	....	....	....	....	....	....	....	....
444 Salladasburg, Lycoming county, ..	....	202 Salladasburg Water Co.,	....	....	....	....	....	1	....	....	1
		203 Sand Spring Water Co. of Meyersdale, Somerset county.	....	....	....	....	....	1	1	....	2
445 Sankertown, Cambria county (Cresson Water Co.)	....		....	....	....	....	....	....	....	....	....
446 Sayre, Bradford county (Bradford County Water Co.)	....		....	....	....	....	....	....	....	....	....
447 Scalp Level, Cambria county (Windber Water and Power Co.)	....		....	....	....	....	....	....	....	....	....
448 Schuylkill Haven, Schuylkill county,	....	204 Schuylkill Haven Gas and Water Co. (Also supplies Cressona, Schuylkill county.)	....	....	....	....	2	1	1	....	4
449 Schuylkill township, Chester county (Phoenixville Municipal Supply) (Springfield Consolidated Water Co.)	....		....	....	....	....	....	....	....	....	....
450 Schuylkill township, Schuylkill county (Moss Glen Water Co.)	....		....	....	....	....	....	....	....	....	....
451 Scranton (city), Lackawanna county (See also Spring Brook Water Supply Co.)	....	205 Scranton Gas and Water Co. (Also supplies Dickson City borough and Throop, Lackawanna county.)	....	....	....	1	....	....	....	.. ..	1
452 Sellersville, Bucks county, ...	64		....	....	....	....	....	....	1	....	1
453 Shade township, Somerset county (Cairnbrook Water Co.) (Windber Water and Power Co.)	....		....	....	....	....	....	....	....	.. .	....
454 Shamokin, Northumberland county (Roaring Creek Water Co.)	....		....	...	....	....	....	....	....	....	....
455 Sharon, Mercer county, ...	....	206 Sharon Water Works Co. (Also supplies Farrell borough and Hickory township, Mercer county.)	....	....	....	....	....	....	..	1	1
456 Sharon Hill, Delaware county (Springfield Water Co.)	....		....	....	....	....	....	....	....	....	....

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
Shavertown, Kingston township, Luzerne county.	....		31 Shaver Bros. Water Works.	....	....	....	....	1	....	....	....	1
Shawnee village, Smithfield township Monroe county.	....	207 Shawnee Water Supply Co.,		....	....	....	1	....	....	....	....	1
457 Sheffield village (Sheffield township), Warren county.	....	208 Sheffield Water Co.,		....	....	1	....	....	....	....	....	1
458 Shenandoah, Schuylkill county (Anthracite Water Co.) (Girard Water Co.)	....			....	....	....	....	...	...	....	....	....
459 Shingle House, Potter county,	....		32 Shingle House Water Co. (Unincorporated.)	....	....	....	....	1	....	....	....	1
460 Shiremanstown, Cumberland county,	....	209 Shiremanstown Water Co.,		....	....	2	....	....	....	....	....	2
461 Shirley township, Huntingdon county (Mt. Union Water Co.)	....			....	....	....	....	....	....	....	....	....
462 Shrewsbury, York county,	65			....	....	....	....	1	1	....	....	2
		210 Silver Creek Water Co. (Blythe township, Schuylkill county.)		....	....	....	....	....	....	1	....	1
463 Sligo, Clarion county,	66			....	....	....	....	....	....	1	....	1
464 Slippery Rock, Butler county,	67			....	....	....	1	....	....	....	....	1
465 Smithfield township, Huntingdon county (Pennsylvania Industrial Reformatory.)	....			....	....	....	....	....	...	....	....	....

466 Smithfield township, Monroe county (Shawnee Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	....
			33 Snably, W. A. (Benson borough and Conemaugh township, Somerset county.)	....	....	....	....	....	....	....	....	1	1
467 Snowden township, Allegheny county (S. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....	....
468 Somerset, Somerset county,	68			....	....	....	....	....	....	1	....	....	1
			34 Somerset County Poor Directors. (Home in Somerset township.)	...	....	1	....	....	....	1	....	....	2
469 Somerset township, Somerset county (Gladhurst Water Co.) (See also Somerset county Poor Directors.)	....			....	....	....	....	....	....	....	....	....	....
470 Souderton, Montgomery county,	69			....	....	....	....	....	....	1	....	....	1
471 South Abington township, Lackawanna county (W. C. Hall, Chinchilla village.)	....			....	....	....	....	....	....	....	....	....	....
472 South Annville township, Lebanon county. (See also Annville Water Co.)	....	211 South Annville Water Supply Co.,		....	....	....	....	1	....	....	....	....	1
473 South Bethlehem, Armstrong county (Citizens Water Co. of New Bethlehem.)	....			...	...	....	....	....	....	....	....	....	....
474 South Bethlehem, Northampton county (Bethlehem City Water Co.) (Bethlehem Steel Co.)	....			....	..	....	....	...	....	....	....	....	....
		212 South Bradford Water Co. (Bradford township, McKean county.)		....	....	1	....	...	....	....	....	....	1
		213 South Easton Water Co. (Easton, Northampton county.)		....	..	....	1	...	1	1	....	....	3
475 South Fork, Cambria county,	....	214 South Fork Water Co.,		....	....	....	....	....	1	....	....	....	1
476 South Lebanon township, Lebanon county (Lebanon Valley Consolidated Water Supply Co.)	....			...	...	....	...	...	....	...	....	....	....

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
477 South Middleton township, Cumberland county (J. C. Bucher, Boiling Springs.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		215 South Pittsburgh Water Co. (Supplies Beech View, Bridgeville, Carnegie, Carrick, Crafton, Greentree, Hays, Heidelberg, Ingram, Knoxville, Mt. Oliver, St. Clair boroughs, and Baldwin, Bethel, Chartiers, Collier, Jefferson, Mifflin, Robinson, Scott, Snowden, Union, and Upper St. Clair townships, also Pittsburgh city, 38th and 42d wards, Sheraden (old 43d ward), and W. Liberty district.)	.....	....	....	....	....	....	....	1	....	1
478 South Renovo, Clinton county, ...	70	.....	.....	....	1	....	....	....	....	....	....	1
South Sharon, now Farrell, *q. v.*...	....	.....	.....	....	....	....	....	....	....	....	....	....
479 Spangler, Cambria county (Northern Cambria Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
		216 Spring Brook Water Supply Co. (Supplies in Lackawanna county Scranton City, Moosic, Old Forge and Taylor boroughs and Lackawanna township; and in Luzerne county Pittston and Wilkes-Barre cities, Ashley, Avoca, Courtdale, Dorranceton, Duryea, Edwardsville, Exeter, Forty Fort, Hughestown, Kingston, Laflin, Larksville, Laurel Run, Luzerne, Miners Mills, Nanticoke, Parsons, Plymouth, Sugar Notch, Swoyersville, Warrior Run, W. Pittston, W. Wyoming, Wyoming, Yatesville boroughs, and Hanover, Jenkins, Kingston, Newport, Pittston, Plains, Plymouth, Pringle and Wilkes-Barre townships.)	.....	...	....	....	....	...	....	1	....	1

Spring City, Chester county. (See Eastern Pennsylvania State Institution for Feeble-Minded and Epileptic.)	....			....	....	....	....	....	....	....	....	....	....
480 Springdale, Allegheny county (Incorporated in 1906.) (See also Springdale Water Co.)	71			....	....	....	....	....	1	....	1	2	
481 Springdale township, Allegheny county. (See also Tarentum Water Co.)	....	217 Springdale Water Co. (Incorporated April 27, 1905, for Springdale township, Allegheny county.) (Supplies Springdale, Allegheny county.)		....	....	1	....	....	....	....	....	1	
482 Springetsbury township, York county (York Water Co.)	....			....	....	....	....	....	....	....	....	....	....
483 Springfield township, Montgomery county.	....	218 Springfield Consolidated Water Co. (Supplies in Delaware county, Radnor township; in Chester county, Easttown, Schuylkill, Tredyffrin, W. Whiteland, Whitemarsh and Willistown townships; in Montgomery county, Abington, Cheltenham, Moreland, Plymouth, Springfield, Upper Dublin and Upper Merion townships, and Conshohocken and Rockledge boroughs and Oak Lane, Philadelphia.		....	....	....	1	....	....	1	....	2	
484 Springfield township, Delaware county.	....	219 Springfield Water Co. (Supplies in Delaware county, Aldan, Clifton Heights, Collingdale, Colwyn, Darby, Eddystone, Glenolden, Lansdowne, Norwood, Prospect Park, Ridley Park, Sharon Hill, and Yeadon boroughs and Darby, Haverford, Marple, Ridley, Springfield, Tinicum and Upper Darby townships; in Montgomery county, Lower Merion township and Narberth borough and Overbrook, Philadelphia.)		....	....	....	1	....	....	1	....	2	
485 Spring Garden township, York county (York Water Co.)	....			....	....	....	....	....	....	....	....	....	....
486 Spring township, Centre county (Pleasant Gap Water Supply Co.)	....			....	....	....	....	....	....	....	....	....	....
			35 State Asylum for Chronic Insane of Pennsylvania. (Wernersville P. O., Heidelberg township, Berks county.)	...	...	....	....	...	1	....	....	1	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
487 State College, Centre county. (See also University Water Co.)	....	220 State College Water Co. (Also supplies Harris township, Centre county.)	.....	....	....	....	1	....	....	....	....	1
			36 State Hospital for Insane. (Mahoning township, Montour county, near Danville.)	...	....	3	....	....	....	....	1	4
			37 State Institution for Feeble Minded of Western Pennsylvania. (Polk, Venango county.)	....	....	....	....	....	....	1	....	1
488 Steelton, Dauphin county, ...	72	.....	.....	....	1	2	....	....	....	....	....	3
			38 Stone, Raymond D. (Bridgeton Village, Bridgeton township, Bucks county.)	....	....	....	....	1	....	....	....	1
489 Stonycreek township, Cambria county (Johnstown Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
490 Stowe township, Allegheny county (Ohio Valley Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
491 Stoyestown, Somerset county, ...	....	221 Stoyestown Water Co., ...	.....	1	....	....	....	....	....	....	....	1
492 Stroudsburg, Monroe county, ...	....	222 Stroudsburg Water Supply Co., ...	.....	....	....	....	....	1	....	....	....	1
		223 Suburban Water Co. of Allegheny county, Pa. (Oakmont and Verona, Allegheny county.)	.....	....	....	....	....	2	1	....	....	4
493 Sugar Creek township, Venango county (Venango Oil and Land Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....

494 Sugar Notch, Luzerne county (Spring Brook Water Supply Co.	....			....	....	....	....	....	....	....	....	....
495 Summit township, Somerset county (Garrett Water Co.)	....			....	....	....	....	....	....	....	....	....
496 Sunbury, Northampton county, ...	....	224 Sunbury Water Co.,		....	....	....	....	1	....	....	....	1
497 Susquehanna township, Cambria county (Northern Cambria Water Co.)	....			....	....	....	....	....	....	....	....	....
498 Susquehanna township, Dauphin county. (See also Dauphin Consolidated Water Supply Co.)	....	225 Susquehanna Township Water Co.,		....	....	....	1	....	....	....	....	1
499 Swatara township, Dauphin county (Beaver Creek Water Co.) (East Mere Water Co.) (Paxtang Consolidated Water Co.) (Rutherford Heights Water Supply Co.)				....	....	....	....	....	....	....	....	....
500 Swissvale, Allegheny county (Pennsylvania Water Co.)	....			....	....	....	....	....	....	....	....	....
501 Swoyersville, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
502 Tamaqua, Schuylkill county, ...	73			....	....	....	1	....	....	....	....	1
503 Tarentum, Allegheny county. (See also Tarentum Water Co.)	74			....	....	....	....	....	....	2	2	4
		226 Tarentum Water Co. (Purchased in 1906 by Allegheny Valley Water Co. which has charter rights in Brackenridge, Cheswick and Tarentum boroughs, and E. Deer, Harmar, Harrison and Springdale townships, Allegheny county. Not active in Cheswick borough and Harmar and Springdale townships.)		....	1	....	....	....	....	....	....	1
504 Taylor township, Lawrence county W. Pittsburgh Water Co.)	....			....	....	....	....	....	....	....	....	....
505 Taylor township, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
506 Telford, Bucks county (Rock Hill Water Co.)	....			....	....	....	....	....	....	....	....	....
		227 Telford Water Co. (W. Telford, Montgomery county.)		....	....	....	...	....	1	....	....	1

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
507 Thompsontown, Juniata county (H. W. Wickersham of Thompsontown Water Co., unincorporated.)	....			....	....	....	....	....	....	....	....	....
508 Throop, Lackawanna county (Scranton Gas and Water Co.)	....			....	....	....	....	....	....	....	....	....
509 Tinicum township, Delaware county (Springfield Water Co.)	....			....	....	....	....	....	....	....	....	....
510 Tobyhanna township, Monroe county (F. C. Miller, for Pocono Pines village.)				....	....	...	.. .	....	....	....	....	....
511 Towanda, Bradford county, ...	....	228 Towanda Water Works Co. (Also supplies Monroe, Clarion county.)		....	....	1	....	....	....	....	....	1
512 Trafford City (borough), Westmoreland county (Pennsylvania Water Co.)	....			....	....	...	....	....	....	....	....	....
513 Tredyffrin township, Chester county (Springfield Consolidated Water Co.)	....			....	...	...	....	....	....	....	....	....
514 Tremont, Schuylkill county, ...	....	229 Tremont Water and Gas Co., ...		....	....	....	....	1	....	....	....	1
		230 Trevorton Water Supply Co. (Zerbe township, Northumberland county.)		....	....	1	...	....	....	....	....	1
		231 Trevose Manor Spring Water Co. (Bensalem township, Bucks county.)		....	....	....	1	....	....	....	....	1

		Tri-Cities Water Co. (New name of consolidation of Charlerol, Donora, and Monessen Water Cos., August 15, 1912.) (Supplies Charlerol, Donora, Monessen, and No. Charlerol boroughs and Carroll and Fallowfield townships, Washington county, and Rostraver township, Westmoreland county.)										
		232 Trout Run Water Co. (Duncannon, Perry county.)				1						1
515 Troy, Bradford county,	75								1	1	2	
516 Turbett township, Juniata county (Port Royal Water Supply Co.)												
517 Turtle Creek, Allegheny county (Pennsylvania Water Co.)												
518 Tuscarora township, Perry county (George A. Rebok.)												
519 Tyrone, Blair county (Bald Eagle Water Co.)												
520 Uniontown, Fayette county,		233 Uniontown Water Co.,				1					1	
521 Union township, Allegheny county (S. Pittsburgh Water Co.)												
522 Unionville, Centre county,	76						1				1	
		234 Unity Water Co. (Penn township, Allegheny county.)				1					1	
		235 University Water Co. (Supplies College and Ferguson townships and State College borough, Centre county.)			1					...	1	
523 Upland, Delaware county (New Chester Water Co.)												
524 Upper Darby township, Delaware county (Springfield Water Co.)												
525 Upper Dublin township, Montgomery county (Springfield Consolidated Water Co.)												
526 Upper Gwynedd township, Montgomery county.		236 Upper Gwynedd Water Co.,							1		1	

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
Upper Mauch Chunk, Carbon county (Mauch Chunk.)	....	237 Upper Mauch Chunk Water Co. (Incorporated October 26, 1872.)	.....	....	....	....	1	....	....	....	1	2
527 Upper Merion township, Montgomery county (Springfield Consolidated Water Co.) (Valley Forge Park Commissioners.)	....	.....	.....	....	....	....	....	....	....	....	....	....
528 Upper Milford township, Lehigh county (Mountain Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
529 Upper Mt. Bethel township, Northampton county (Portland Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
530 Upper Nazareth township, Northampton county (Blue Mountain Consolidated Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
531 Upper Providence township, Montgomery county (Phoenixville Municipal Supply.)	....	.....	.....	....	....	....	....	....	....	....	....	....
532 Upper St. Clair township, Allegheny county (So. Pittsburgh Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
			39 Valley Forge Park Commissioners. (Upper Merion township, Montgomery county.)	....	....	....	....	....	....	1	....	1
Van Meter, Rostraver township, Westmoreland county (Pittsburgh Coal Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
			40 Venango Oil and Land Co. (Sugar Creek township, Venango county.)	....	....	...	....	1	....	....	....	1

		238 Venango Water Co. (Received permits in 1906 and 1907. Plant purchased by city of Franklin, Venango county.)		*	*	....	....	....	....	....	....	*
533 Verona, Allegheny county (Suburban Water Co. of Allegheny county, Pa.)	....			....	....	....	....	....	....	....	....	....
			41 Vest Coal Co. (Point View Village, E. Bethlehem township, Washington county.)	....	....	....	....	....	1	....	....	1
534 Wall, Allegheny county (E. McKeesport Water Co.)	....			....	....	....	....	....	....	....	....	....
535 Warren, Warren county,	....	239 Warren Water Co.,		....	1	1	....	.. .	....	1	....	3
536 Warrior Run, Luzerne county (Spring Brook Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
537 Washington township, Franklin county (Blue Ridge Water Supply Co.)	....			....	....	....	....	....	....	....	....	....
538 Washington township, Lehigh county.	....	240 Washington Water Supply Co.,		....	....	....	....	....	....	1	....	1
539 Washington township, Northampton county (Blue Mountain Consolidated Water Co.) (Pompeii Water Co.)	....			...	....	....	....	...	....	....	....	....
540 Waterford, Erie county,	....	241 Waterford Water Co.,		....	....	1	....	....	....	....	1	2
541 Wayne township, Lawrence county (Ellwood Water Co.)	....			....	....	....	....	....	....	....	....	....
542 Weatherly, Carbon county, ...	....	242 Weatherly Water Co.,		....	....	....	....	1	....	....	....	1
		243 Weldon Water Co. (Abington township, Montgomery county.)		....	....	....	....	1	....	....	....	1
543 Wellsboro, Tioga county,	....	244 Wellsboro Water Co.,		....	....	2	....	....	....	1	1	4
Wernersville, Berks county. (See State Asylum.)	....			....	....	....	....	....	....	....	....	....
544 West Berwick, Columbia county,..	....	245 West Berwick Water Supply Co.,		....	....	....	1	....	....	....	....	1
West Bethlehem, Lehigh county (Bethlehem City Water Co.)	....			....	....	....	....	....	....	....	....	....

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905–06	1907	1908	1909	1910	1911	1912	1913	Total.
545 West Bethlehem township, Washington county (Marianna Water Co.)	....			....	....	....	....	....	....	....	....	....
546 West Bridgewater, Beaver county (Beaver Valley Water Co.)	....			....	....	....	....	....	....	....	....	....
547 West Chester, Chester county, ...	77			....	....	....	....	1	....	....	....	1
548 West Conshohocken, Montgomery county.	....	246 West Conshohocken Water Co., ...		....	....	....	....	....	....	2	....	2
549 West Donegal township, Lancaster county (Rheems Water Co.)	....			....	....	....	....	....	....	....	....	....
550 Westfall township, Pike county (Matamoras Citizens Water Co.)	....			....	....	....	....	....	....	....	....	....
551 West Hazleton, Luzerne county Diamond Water Co. of Hazleton.)	....			....	....	....	....	....	....	....	....	....
		247 West Houtzdale Water Co. (Woodward township and Brisbin borough, Clearfield county.)		....	....	....	1	....	....	....	....	1
552 West Mahanoy township, Schuylkill county (Anthracite Water Co.) (Girard Water Co.)	....			....	....	....	....	....	....	....	....	....
553 West Manchester township, York county (York Water Co.)	....			....	....	....	....	....	....	....	....	....
554 Westmont, Cambria county (Johnstown Water Co.)	....											

		248 Westmoreland Water Co. of Hempfield township. (One of eight companies operating systems supplying Greensburg (part), Hempfield, No. Huntingdon and Penn townships and Irwin, Jeannette, Manor, N. Irwin, Penn and Youngwood boroughs, Westmoreland county.)				1					1
555 West Norriton township, Montgomery county.	....	249 West Norriton Water Co.,	....	....	....	....	....	....	1	....	1
West Pittsburgh (P. O.) village, Taylor township, Lawrence county.	....	250 West Pittsburgh Water Co. (For Taylor township, Lawrence county.)	1	....	....	....	1	....	....	....	2
556 West Pittston, Luzerne county (Spring Brook Water Supply Co.)	....		....	....	....	....	....	....	....	....	....
557 West Pottsgrove township, Montgomery county (Pottstown Gas and Water Co.)	....		....	....	....	....	....	....	....	....	....
558 West Reynoldsville, Jefferson county (Reynoldsville Water Co.)	....		....	....	....	....	....	....	....	....	....
		251 West Salem Water Supply Co. (Salem township, Luzerne county.)	....	....	....	1	....	....	....	....	1
559 West Telford, Montgomery county (Telford Water Co.)	....		....	....	....	....	....	....	....	....	
560 West View, Allegheny county (Ohio Valley Water Co.)	....		....	....	....	....	....	....	....	....	....
561 West Whiteland township, Chester county (Springfield Consolidated Water Co.)	....		....	....	....	....	....	....	....	....	....
562 West Wyoming, Luzerne county (Spring Brook Water Supply Co.)	....		....	....	....	....	....	....	....	....	....
563 Whitehall township, Lehigh county (Clear Springs Water Co.)	....		....	....	....	....	....	....	....	....	....
564 Whitemarsh township, Montgomery county (Springfield Consolidated Water Co.)	....		....	....	....	....	....	....	....	....	....
565 Wickboro, Armstrong county (Citizens Water Co. of Kittanning.)	....		....	....	....	....	....	....	....	....	...

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905 -06	1907	1908	1909	1910	1911	1912	1913	Total.
			42 Wickersham, H. W., of Thompsontown Water Co., unincorporated. (Thompsontown, Juniata county.)	....	....	....	...	1	....	1	....	2
566 Wiconisco township, Dauphin county (Lykens Water Co.)	...	.....	.....	....	....	....	....	....	....	....	....	....
567 Wilkes-Barre (city), Luzerne county (Spring Brook Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
568 Wilkes-Barre township, Luzerne county (Spring Brook Water Supply Co.)	....	.....	.....	....	....	...	....	...	....	....	....	....
569 Wilkinsburg, Allegheny county (Pennsylvania Water Co.)	....	.....	.....	....	....	....	....	...	....	....	....	....
570 Wilkins township, Allegheny county (Pennsylvania Water Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
			43 Williams, James S. (Somerton, Philadelphia.)	1	...	....	....	....	....	....	....	1
571 Williamsport (city), Lycoming county. (See also Citizens Water and Gas Co. of Williamsport.)	....	252 Williamsport W[illegible]r Co., ...	.....	....	....	....	....	1	....	....	....	1
572 Willistown township, Chester county (Springfield Consolidated Water Co.)		.....	.....	...	....	....	....	....	....	....	....	....
573 Wilmerding, Allegheny county (E. McKeesport Water Co.) (Pennsylvania Water Co.)	...	.....	.....	....	....	....	....	....	....	....	....	....

574 Windber, Somerset county,	....	253 Windber Water and Power Co. (Also supplies in Cambria county Scalp Level borough and Richland township, and in Somerset county Paint and Windber boroughs and Paint and Shade townships.)				2					1	3		
575 Wind Gap, Northampton county (Blue Mountain Consolidated Water Co.)	....													
		254 Windsor Water Co. (Hamburg, Berks county.)									1	1		
576 Winslow township, Jefferson county (Reynoldsville Water Co.)														
577 Woodlawn, Beaver county (Jones and Laughlin Steel Co.)	....													
578 Woodward township, Clearfield county (W. Houtzdale Water Co.)	....													
579 Wormleysburg, Cumberland county (Riverton Consolidated Water Co.)	....													
580 Worth township, Centre county (Port Matilda Water Co.)	....													
581 Wrightsville, York county,	....	255 Wrightsville Water Supply Co.,					1					1		
582 Wyalusing, Bradford county,	....	256 Wyalusing Water Co.,						1				1		
			11 Wyland, John F. (Allison Park, Hampton township, Allegheny county.)						1			1		
583 Wyoming, Luzerne county (Spring Brook Water Supply Co.)	....													
584 Yatesville, Luzerne county (Spring Brook Water Supply Co.)	....													
585 Yeadon, Delaware county (Spring-	....													
586 Yoe, York county,	....	257 Yoe Water Co. (Permit* in 1909. Merged into York County Consolidated Water Co. April 1, 1909, which see.)				•						•		

WATER WORKS PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH—Continued.

Municipalities Supplied (Numbered); also Important Villages and Post Offices.	Classification of Water Works.			Permits and Decrees.								
	Municipal.	Water Company.	Miscellaneous.	1905-06	1907	1908	1909	1910	1911	1912	1913	Total.
587 York (city), York county, ...	....	258 York Water Co. (Also supplies Hellam, Manchester, Springetsbury, Spring Garden and W. Manchester townships, York county.)	.....	....	....	1	....	1	1	....	....	3
		259 York County Consolidated Water Co. (Dallastown and Yoe.) (Formed by merger April 1, 1909, including Yoe Water Co. which received permit* in 1909.)	.....	...	...	....	*1	....	....	1	1	3
588 Youngwood, Westmoreland county (Westmoreland Water Co. of Hempfield township.)	....	.....	.....	....	....	....	....	....	....	....	....	....
589 Zerbe township, Northumberland county (Trevorton Water Supply Co.)	....	.....	.....	....	....	....	....	....	....	....	....	....
			45 Zierdon, W. E. (Johnsonburg, Elk county.)	1	....	....	....	....	...	....	....	1

CLASSIFICATION OF SOURCES OF WATER SUPPLY COVERED IN PERMITS AND DECREES ISSUED 1905-1913.

Of the 381 water works systems, the subjects of permits or decrees, (and it should be understood that every permit is a decree, but that every decree is not necessarily a permit), 105 systems obtain their sources of supply from ground water only, 161 from surface sources only, and 111 from both ground and surface water sources, and four systems, those of the Mauch Chunk Township Water Company, the Yoe Water Company, the Venango Water Company, and the Bristol Water Company, have been taken over by other owners, to whom subsequent permits or decrees have been issued, as shown in the preceding table.

In the following table are given the names of the owners of the water works systems, the subjects of permits or decrees, that secure, or propose to secure, their sources of supply from ground water only:

WATER WORKS SYSTEMS SUPPLIED FROM *GROUND WATER SOURCES* ONLY WHICH HAVE BEEN MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913.

	Water Works Owner.	Ground Water Sources.	
		Wells.	Springs.
1.	Akron Borough,	•	
2.	Albion Borough,		•
3.	Allison Park Water Co.,	•	
4.	Allwine, Jerry, (Johnstown),		•
5.	Ambridge Borough,	•	
6.	Aunville Water Co.,	•	•
7.	Avonmore Borough,	•	
8.	Baden Borough,	•	
9.	Benton Water Co.,		•
10.	Berkebile, S. P., (Benson),		•
11.	Bethlehem Borough,	•	•
12.	Bethlehem Steel Co.,		•
13.	Biglerville Water Co.,		•
14.	Bloomfield Water and Sewer Co.,		•
15.	Blue Ridge Water Supply Co.,	•	
16.	Boyer, J. Calvin, (Perry Twp., Snyder County),		•
17.	Brickel, B. W., (Dallas),	•	
18.	Bucher, J. C., (Boiling Springs),	•	
19.	Catasauqua Borough	•	
20.	Christiana Gravity Water Co.,		•
21.	Conneaut Lake Borough,	•	
22.	Connellsville Borough,		•
23.	Consolidation Coal Co. (Jenner Twp., Somerset County),	•	
24.	Conway Borough,	•	
25.	Coopersburg Borough,	•	•
26.	Coraopolis Borough,	•	
27.	Crosby Gas Co. (Newerf Village, Norwich Township, McKean county,)		•
28.	Curtis, J. G., Leather Co. (Ludlow),		•
29.	Dallas Water Co.,		•
30.	Dawson Borough,	•	
31.	Dickerson Run Water Co.,	•	
32.	Dillsburg Water Co.,		•
33.	Dover Borough,	•	
34.	East Brady Water Works Co.,	•	•
35.	East Donegal Water Co. (from Florin Water Co.),	•	
36.	Edinboro Borough,	•	
37.	Emaus Borough,	•	•
38.	Ephrata Borough,	•	•
39.	Farwell, Absalom, (Chapman Township, Clinton county),		•
40.	Florin Water Co.,	•	
41.	Genesee Citizens Water Co.,		•
42.	Gladehurst Water Co.,		•
43.	Greencastle Borough,		•
44.	Green Hill Water Co.,	•	
45.	Hall, W. C. (South Abington Twp., Lackawanna County),		•
46.	Heidelberg Water Co. (Unincorporated),		•

WATER WORK SYSTEMS SUPPLIED FROM *GROUND WATER SOURCES* ONLY WHICH HAVE BEEN MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913—Continued.

	Water Works Owner.	Ground Water Sources.	
		Wells.	Springs.
47.	Hellam Water Co.,	.....	*
48.	Hilltown Water Co.,	*	.....
49.	Hopbottom Water Co.,	.....	*
50.	Jones & Laughlin Steel Co. (Woodlawn),	*	.....
51.	Josephine Water Co.,	*	.....
52.	Knoxville Borough,	*	*
53.	Lansdale Water Co.,	*	.....
54.	Lenni Heights Water Co.,	*	.....
55.	Lower Gwynedd Water Co. (from North Wales Water Co.),	*	.....
56.	Madera Water Co.,	.....	*
57.	Mars Borough,	*	.....
58.	Matamoras Citizens Water Co.,	*	.....
59.	Miller, F. C. (Pocono Pines),	*	*
60.	Mountain Water Co.,	*	*
61.	Mountville Borough,	*	*
62.	North Wales Water Co.,	*	.....
63.	Ohio Valley Water Co.,	*	.....
64.	Orbisonia Water Co.,	.....	*
65.	Oxford Borough,	*	.....
66.	Parkesburg Borough,	*	*
67.	Paxtang Consolidated Water Co.,	.....	*
68.	Pleasant Gap Water Supply Co.,	.....	*
69.	Pleasantville Borough,	*	.....
70.	Port Matilda Water Co.,	.....	*
71.	Rebok, George A. (Tuscarora Twp., Perry County),	.....	*
72.	Red Lion Water Co.,	*	*
73.	Reliance Water Co.,	*	.....
74.	Rheems Water Co.,	*	.....
75.	Rimersburg Borough,	*	.....
76.	Ringtown Spring Water Supply Co.,	*	.....
77.	Rochester, J. H. (Marion Center Water Co., uninc.),	.....	*
78.	Rock Hill Water Co.,	*	.....
79.	Roselawn Water Co.,	*	.....
80.	Rural Valley Borough,	*	.....
81.	Shawnee Water Supply Co.,	.....	*
82.	Shingle House Water Co.,	*	*
83.	Sligo Borough,	*	.....
84.	Slippery Rock Borough,	*	.....
85.	Snably, W. A. (Benson),	.....	*
86.	Somerset Borough,	*	.....
87.	Somerset County Home,	*	*
88.	Souderton Borough,	*	*
89.	South Bradford Water Co.,	.....	*
90.	South Easton Water Co.,	*	*
91.	Springdale Borough,	*	*
92.	Springdale Water Co.,	*	.....
93.	Stone, Raymond D., (Bridgeton Village, Bridgeton Township, Bucks county.)	.....	*
94.	Stoyestown Water Co.,	*	.....
95.	Telford Water Co.,	*	.....
96.	Trevorton Water Supply Co.,	.....	*
97.	Trevose Manor Spring Water Co.,	.....	*
98.	Uniouville Borough,	.....	*
99.	Upper Gwynedd Water Co. (from North Wales Water Co.),	*	.....
100.	Venango Oil and Land Co.,	.....	*
101.	Waterford Water Co.,	.....	*
102.	Wickersham, H. W., (Thompsontown),	*	*
103.	Williams, J. S., (Somerton),	*	.....
104.	Wyland, John F. (Allison Park),	*	.....
105.	Zierdon, W. E., (Johnsonburg),	*	.....

It appears that the ground water sources subdivided, are as follows:

Wells only,	49
Springs only,	38
Wells and springs,	18
Total,	105

The water works systems which have been made the subjects of permits or decrees, which systems obtain, or propose to obtain, their supplies from surface waters only, are given in the following table:

WATER WORKS SYSTEMS SUPPLIED FROM *SURFACE WATERS ONLY* WHICH HAVE BEEN MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913.

	Water Works Owner.	Remarks.
1.	Albion Water Co., ...	Not Built.
2.	Anthracite Water Co., ...	
3.	Apollo Water Works Co., ...	
4.	Ashland Borough, ...	
5.	Bald Eagle Water Co., ...	
6.	Barnesboro Water Co.—Merged with Spangler Water Co. into Northern Cambria Water Co.; distributing pipes in Barnesboro sold to borough in 1913.	
7.	Beaver Creek Water Co., ...	
8.	Beaver Valley Water Co., ...	
9.	Bens Creek Water Co., ...	
10.	Berwick Water Co., ...	
11.	Blandburg Water Co., ...	
12.	Bloomsburg Water Co., ...	
13.	Blossburg Water Co., ...	
14.	Boalsburg Water Co., ...	
15.	Boyer, J. Calvin (Monroe Township, Snyder County).	
16.	Bradford County Water Co., ...	Not built.
17.	Bright Run Water Co., ...	
18.	Bristol Borough, ...	
19.	Brockway Crystal Water Co., ...	
20.	Brookville Water Co.,—Plant sold to borough.	
21.	Butler Water Co., ...	
22.	Cairnbrook Water Co., ...	Filtration to be approved and installed before using source.
23.	Chambersburg Borough, ...	
24.	Charleroi Water Co.,—Sold to Monessen Water Co.	
25.	Chichester Water Co., ...	Supply from New Chester Water Co.
26.	Citizens Water & Gas Co. of Williamsport.	
27.	Citizens Water Co. of Canton, ...	
28.	Citizens Water Co. of Confluence,	
29.	Citizens Water Co., of New Bethlehem.	
30.	City of New Castle Water Co., ..	
31.	Clearfield Water Co., ...	
32.	Clymer Water Co. of Indiana, ...	
33.	Coatesville Borough, ...	
34.	Cresson Borough, ...	Supply from Summit Water Supply Co.
35.	Danville Borough, ...	
36.	Dingmans Ferry Water Co., ...	
37.	Donora Water Co.—Sold to Monessen Water Co.	
38.	DuBois Borough, ...	
39.	East Greenville Borough, ...	
40.	East Mere Water Co.—Sold to Harrisburg.	Former source discontinued.
41.	Ebensburg Coal Co. (Colver)—Plant taken over by Colver Water Co. Co. in 1913.	
42.	Edgemont Water Co., ...	Supply from New Chester Water Co.
43.	Ellwood Water Co., ...	
44.	Emporium Water Co., ...	

WATER WORKS SYSTEMS SUPPLIED FROM *SURFACE WATERS ONLY* WHICH HAVE BEEN MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913—Continued.

	Water Works Owner.	Remarks.
45.	Erie City,	
46.	Evitts Creek Water Co.,	
47.	Extension Water Co. of Penbrook,	Supply from Susquehanna Township Water Co.
48.	Fairchance Borough,	Supply from Trotter Water Co.
49.	Fairview Water Co.—Dissolved Sept. 15, 1910.	Not built.
50.	Falls Creek Borough,	
51.	Freeport Water Works Co.,	
52.	Garrett Water Co.,	
53.	Gilberton-Schuylkill Water Co.,	Supply from Bright Run Water Co.
54.	Girardville Water Co.,	Supply from Bright Run Water Co.
55.	Girard Water Co.,	
56.	Glen Brook Water Co.,	Not built.
57.	Gravel Hill Water Supply Co.,	Supply from Lebanon Valley Cons. Water Supply Co.
58.	Greenville Water Co.,	
59.	Hallstead Water Co.,	
60.	Harrisburg City,	
61.	Hegins Water Co.,	
62.	Hock, Coombe & Brumm, (Mar-Lin Village, Schuylkill Co.)	Supply from Minersville Water Co.
63.	Honesdale Consolidated Water Co.,	
64.	Hooversville Water Co.,	
65.	Horner, H. M., (Summerdale),	
66.	Hummelstown Consolidated Water Co.	
67.	Huntingdon Water Supply Co.,	
68.	Jersey Shore Water Co.,	
69.	Johnsonburg Water Co.,	
70.	Johnstown Water Co.,	Emergency supply from Manufacturers Water Co.
71.	Juniata Borough,	
72.	Kensington Water Co.,	
73.	Kulpmont Water Co.,	
74.	Lancaster City,	
75.	Lancaster Water Filtration Co.,	Filters water for municipal system.
76.	Latrobe Water Co.,	
77.	Lebanon Valley Consolidated Water Supply Co.	
78.	Ligonier Borough,	
79.	Lock Haven City,	
80.	Lykens Water Co.,	
81.	McKeesport City.	
82.	Manheim Township Water Co.,	Supply from Lancaster City.
83.	Marianna Water Co.,	
84.	Marietta Gravity Water Co.,	
85.	Marie Water Co.,	
86.	Mar-Lin Water Co.,	Filtration to be approved and installed before using source.
87.	Martindale Water Co.,	
88.	Masontown Borough,	
89.	Mercersburg Water Co.,	
90.	Middleport Water Co.,	Supply from Silver Creek Water Co.
91.	Middletown & Swatara Consolidated Water Co.	
92.	Midland Water Co.,	
93.	Minersville Water Co.,	
94.	Monessen Water Co.—Now Tri-Cities Water Co.	
95.	Moore Water Co.,	Supply from Suburban Water Co. of Allegheny County, Pa.
96.	Moss Glen Water Co.,	Supply from Silver Creek Water Co.

WATER WORKS SYSTEMS SUPPLIED FROM *SURFACE WATERS ONLY* WHICH HAVE BEEN MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913—Continued.

	Water Works Owner.	Remarks.
97.	Mt. Union Water Co., ...	
98.	Muncy Water Supply Co., ...	
99.	Nant-y-Glo Water Co. (Unincorporated).	
100.	New Chester Water Co., ...	
101.	New Oxford Borough, ...	
102.	Nicholson Water Co., ...	
103.	Nippenose Water Co., ...	Same source as Jersey Shore Water Co.
104.	Norristown Insurance & Water Co.	
105.	North Annville Water Supply Co.,	Supply from Lebanon Valley Cons. Water Supply Co.
106.	North Cornwall Water Supply Co.,	Supply from Lebanon Valley Cons. Water Supply Co.
107.	North Manheim Water Co., ...	
108.	North Strabane Water Co., ...	
109.	Parker City Water Co., ...	
110.	Penn Land Co., ...	Proposed works. Supply from Crystal Water Co. and Silver Creek Water Co.
111.	Pennsylvania Water Co., ...	
112.	Perkasie Water Supply Co., ...	
113.	Phoenixville Borough, ...	
114.	Pittsburgh City, ...	
115.	Pittsburgh Coal Co. (Van Meter, Westmoreland County).	
116.	Plainfield Water Co., ...	
117.	Pompeii Water Co., ...	
118.	Portland Water Co., ...	
119.	Pottstown Gas & Water Co., ...	
120.	Renovo Borough, ...	
121.	Richland Township Water Co., ..	
122.	Ridgway Borough, ...	
123.	Ridley Water Co., ...	Supply from New Chester Water Co.
124.	Riverton Consolidated Water Co.,	
125.	Roaring Creek Water Co., ...	
126.	Rutherford Heights Water Supply Co.	Supply from Hummelstown Cons. Water Co.
127.	Salladasburg Water Co., ...	Same source as Jersey Shore Water Co.
128.	Schuylkill Haven Gas & Water Co.,	
129.	Scranton Gas & Water Co., ...	
130.	Sharon Water Works Co., ...	
131.	Sheffield Water Co., ...	
132.	Shiremanstown Water Co., ...	Supply from Riverton Cons. Water Co.
133.	South Annville Water Supply Co.,	Supply from Lebanon Valley Cons. Water Supply Co.
134.	South Fork Water Co., ...	
135.	South Pittsburgh Water Co., ...	
136.	South Renovo Borough, ...	
137.	Spring Brook Water Supply Co., .	
138.	Springfield Consolidated Water Co.,	
139.	Springfield Water Co., ...	
140.	State Asylum for Chronic Insane of Pennsylvania (Wernersville).	
141.	State Hospital for the Insane, near Danville.	
142.	Steelton Borough, ...	
143.	Suburban Water Co. of Allegheny County, Pa.	
144.	Sunbury Water Co., ...	
145.	Susquehanna Township Water Co.,	Supply from Rutherford Heights Water Supply Co.
146.	Tamaqua Borough, ...	
147.	Tarentum Borough, ...	
148.	Tarentum Water Co., ...	
149.	Uniontown Water Co., ...	

WATER WORKS SYSTEMS SUPPLIED FROM *SURFACE WATERS ONLY* WHICH HAVE BEEN MADE THE SUBJECTS OR *PERMITS OR DECREES*, 1905-1913—Continued.

Water Works Owner.	Remarks.
150. Unity Water Co.,	Supply from Suburban Water Co. of Allegheny County, Pa.
151. Valley Forge Park Commission, ..	Supply from Springfield Cons. Water Co.
152. Warren Water Co.,	
153. Washington Water Supply Co., ..	
154. Weatherly Water Co.,	
155. West Chester Borough,	
156. Westmoreland Water Co. of Hempfield Township.—Allied with other water companies.	
157. West Norriton Water Co.,	Supply from Norristown Insurance & Water Co.
158. West Pittsburgh Water Co.,	
159. Windber Water & Power Co.,	
160. Wyalusing Water Co.,	
161. York Water Co.,	

The water works systems which are supplied from both surface and ground water sources that have been made the subjects of permits or decrees are named in the following table:

WATER WORKS SYSTEMS SUPPLIED FROM *SURFACE AND GROUND WATER SOURCES* MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913.

Water Works Owner.	Sources.		
	Wells.	Springs.	Surface.
1. Arendtsville Water Co.,		*	*
2. Austin Borough,	*	*	*
3. Bangor Water Co.,		*	*
4. Bath Borough,		*	*
5. Bethlehem City Water Co.,		*	*
6. Blackwood Water Co.,		*	*
7. Blairsville Borough,	*		*
8. Blue Mountain Consolidated Water Co.,	*	*1	*
9. Bradford City,	*		*
10. Briar Creek Water Supply Co.,		*	*
11. Cambridge Springs Borough,	*		*
12. Catawissa Water Co.,	*	*	*
13. Citizens Water Co. of Gordon,		*	*
14. Citizens Water Co. of Kittanning,	*	*	*
15. Clarion Water Co.,	*		*2
16. Clear Springs Water Co.,		*	*
17. Consolidated Water Co. of Coudersport,	*	*	*
18. Cresson Water Co.,	*	*	*3
19. Dauphin Consolidated Water Supply Co.,	*		*
20. Denver Borough,		*	*
21. Diamond Water Co. of Hazleton,	*	*	*
22. Doylestown Borough,	*	*	*2
23. DuBois, John E.,		*	*
24. Eagles Mere Water Co.,	*		*1
25. Eastern Pennsylvania State Institution for Feeble-Minded and Epileptic,	*		*
26. East McKeesport Water Co.,		*	*
27. Emlenton Water Co.,	*		*
28. Foxburg Water Works Co.,	*		*
29. Franklin City,	*	*	*
30. Galeton-Eldred Water Co. (for Galeton),		*	*
31. Gettysburg Water Co.,	*1		*
32. Glen Mills Schools, Girls' Dept. (Darling),	*		*5
33. Glen Rock Borough,	*	*	*
34. Halifax Water Co.,		*	*1
35. Hamilton Water Co.,		*	*
36. Hanover and McSherrystown Water Co.,		*2	*

WATER WORKS SYSTEMS SUPPLIED FROM *SURFACE AND GROUND WATER SOURCES* MADE THE SUBJECTS OF *PERMITS OR DECREES*, 1905-1913—Continued.

	Water Works Owner.	Sources.		
		Wells.	Springs.	Surface.
37.	Hayesville Water Co.,	*2	•	•
38.	Hazleton Water Co.,	•	.....	•
39.	Hazle Township Water Co.,	•	.....	•
40.	Hershey Water Co.,	.....	•	•
41.	Homestead Borough,	•	.....	•
42.	Houtzdale Water Co.,	•	.....	•
43.	Hyndman Water Co.,	•	.....	•
44.	Jacks Mountain Water Co.,	.....	•	•
45.	Jenkintown Water Co. (from Moreland Spring Water Co.,	•	•	•
46.	Koppel Water Co.,	*2	.....	•
47.	Lebanon City,	*1	.....	•
48.	Lehigh Water Co.,	.....	•	•
49.	Londonderry Water Co.,	•	•	•
50.	Luzerne County Central Poor District,	•	.....	•
51.	Macungie Borough,	.....	•	•
52.	Mahanoy City Water Co.,	•	.....	•
53.	Marysville Water Co.,	.....	•	•
54.	Mauch Chunk Water Co.,	•	•	•
55.	Mechanicsburg Gas and Water Co.,	.. ..	•	•
56.	Millersburg Home Water Co.,	•	•	•
57.	Milnesville Water Co.,	.....	•	•
58.	Mokoma Spring Water Co.,	.....	•	•
59.	Montgomery Water Co.,	•	.....	•
60.	Moreland Spring Water Co.,	•	•	•
61.	Morrellville and Cambria Borough Water Co.,	•	.....	•
62.	Mt. Penn Suburban Water Co.,	•	.....	•
63.	Myerstown Water Co.,	.....	•	•
64.	Natrona Water Co.,	.....	•	•
65.	Nescopeck Water Supply Co.,	.....	•	•
66.	Newport Home Water Co.,	•	•	•
67.	North East Borough,	.....	•	•
68.	Northumberland Water Co.,	•	•	•
69.	Ogontz Water Co. (from Moreland Spring Water Co., ..	•	•	•
70.	Palmer Water Co.,	•	•	•
71.	Panther Valley Water Co.,	•	.....	•
72.	Pennsburg Water Co.,	.....	•	•
73.	Pennsylvania Industrial Reformatory (near Huntingdon),	.....	•	*5
74.	Pennsylvania Training School (Morganza),	•	•	•
75.	Port Allegany Water Co.,	•	•	•
76.	Port Royal Water Supply Co.,	.....	•	•
77.	Punxsutawney Water Co.,	*1	.....	•
78.	Quarryville Water Co.,	.....	•	•
79.	Ramey Water Co.,	•	.....	•
80.	Reading City,	.....	•	•
81.	Reading Suburban Water Co.,	•	.....	•
82.	Red Hill Water Co.,	.....	•	•
83.	Reynoldsville Water Co.,	•	•	•
84.	Roulette Water Co.,	.....	•	•
85.	Saegertown Borough,	•	.....	*6
86.	St. Marys Water Co.,	•	.....	•
87.	Sand Spring Water Co. of Meyersdale,	•	.....	•
88.	Sellersville Borough,	•	•	•
89.	Shavers Brothers (Shavertown),	•	.....	•
90.	Shrewsbury Borough,	•	•	*7
91.	Silver Creek Water Co.,	.....	*8	•
92.	State College Water Co. (well supply is auxiliary and obtained from the College),	*1	.....	•
93.	State Institution for Feeble-Minded of Western Pennsylvania (Polk), ..	.....	•	*1
94.	Stroudsburg Water Supply Co.,	.....	•	•
95.	Towanda Water Co.,	.....	•	•
96.	Tremont Water and Gas Co.,	.....	•	•
97.	Trout Run Water Co.,	.....	•	•
98.	Troy Borough,	•	•	•
99.	University Water Co. (auxiliary supply from State College Water Co.),	*1	.....	•
100.	Upper Mauch Chunk Water Co.,	.....	•	•
101.	Vesta Coal Co. (Point View Village, Westmoreland Co.),	•	•	•
102.	Weldon Water Co. (from Moreland Spring Water Co.), ..	•	•	•
103.	Wellsboro Water Co.,	•	•	•
104.	West Berwick Water Supply Co.,	.....	•	•
105.	West Conshohocken Water Co.,	....	•	•
106.	West Houtzdale Water Co.,	•	.....	•
107.	West Salem Water Supply Co.,	.. ..	•	•
108.	Williamsport Water Co.,	*1	.....	•
109.	Windsor Water Co.,	•	.....	•
110.	Wrightsville Water Supply Co.,	.....	•	•
111.	York County Consolidated Water Co.,	.....	•	•

[1]Auxiliary. [2]Emergency. [3]Proposed. [4]Temporary emergency. [5]Not domestic. [6]Emergency, without permit. [7]For ram. [8]Auxiliary—part of supply obtained from Crystal W. Co.

SUMMARY OF WATER WORKS SOURCES.

There are 216 water works systems having ground water sources in whole or in part, and 272 systems having surface water sources in whole or in part. Of the 216 instances where the supply is ground water, in whole or in part, it is obtained from wells in 132 cases, from springs in 131 cases and from wells and springs in 47 cases.

In four instances only do the surface waters come from natural bodies of water or lakes, namely, the Honesdale Consolidated Water Company, the Myerstown Water Company, (of Jackson Township, Lebanon County), the Eagles Mere Water Company, and the Citizens Water Company of Canton.

WATER FILTERS MADE THE SUBJECTS OF PERMITS OR DECREES.

Filter designs for one hundred water works systems have been submitted to the Department and made the subjects of permits or decrees. These one hundred systems comprise a total of ninety-five separate filter plants in operation or under construction: seven preliminary designs to be executed when financial arrangements are completed or after detailed or modified plans have been submitted for the further approval of the Department; six plants not built; and two plants which have been abandoned. In all, 110 filter designs have been examined and passed upon. The permits to the Beaver Valley Water Company cover two plants; those to the City of Reading, four plants; and those to the Springfield Companies, four plants. Two designs have been considered for Bristol, a proposed new plant and the plant later purchased by the borough from the old Bristol Water Company. Two designs have been considered for Coatesville, a pressure filter, approved as an emergency measure at the time of the typhoid outbreak in 1912, and the preliminary plans submitted to the Department for a new source and permanent filtration works. Two designs have been considered for the water works systems consolidated into the Monessen Water Company (now known as the Tri-Cities Water Company) the original plant of the Charleroi Water Company, now abandoned, and the present plant of the Tri-Cities Water Company. Two designs have been considered for the Schuylkill Haven Gas and Water Company, the first having been disapproved. In addition to the hundred water works systems for which filter designs have been reviewed thirteen water works systems have received permits or decrees relative to furnishing filtered water from the plants of other systems and are entered in the following table, although not numbered.

WATER FILTER DESIGNS MADE THE SUBJECTS OF PERMITS OR DECREES.

Water Works Owner.	Type of Filter Plant.			
	Slow Sand.	Mechanical.		Miscellaneous.
		Gravity.	Pressure.	
1 Apollo Water Works Co.,	Old,			
2 Bangor Water Co.,		Preliminary plan,		
3 Beaver Creek Water Co.,		New (not domestic supply).		
4 Beaver Valley Water Co.,		Two old,		
5 Berwick Water Co.,		New,		
6 Bethlehem City Water Co.,				Old, semi-slow.
7 Bethlehem Steel Co.,		New,		
8 Bloomsburg Water Co.,		New,		
9 Bristol Borough		Not built,		
Plant purchased from Bristol Water Co.,		New,		
10 Brookville Water Co. (Sold to Borough),		New,		
11 Butler Water Co.,		Old,		
12 Cambridge Springs Borough,		New,		
Charleroi Water Co. (Sold to Monessen Water Co.),				
13 Citizens Water Co. of Canton,		Old,		
14 Citizens Water Co. of Kittanning. (Sold to Armstrong Water Co.)				Old crib, not used.
15 Citizens Water Co. of New Bethlehem,		Addition,		
16 City of New Castle Water Co.,		Addition,		
17 Clarion Water Co.,		Remodeled,		
18 Clear Springs Water Co.,		New,		
19 Clymer Water Co. of Indiana,		New,		
20 Coatesville Borough,	Preliminary plan,		New (emergency),	
21 Consolidation Coal Co.,		New,		
22 Danville Borough,		Remodeled,		
23 Dauphin Consolidated Water Supply Co.,		New,		
Donora Water Co. (Sold to Monessen Water Co.),				
24 Eagles Mere Water Co.,			New,	
25 Eastern Pennsylvania State Institution for Feeble-Minded and Epileptic, near Spring City. (Supply from Home Water Co. of Royersford.)		Old,		
26 East Greenville,		New,		
27 Ellwood Water Co.,		New,		
28 Emporium Water Co.,		Preliminary plan,		
29 Erie City,		New,		
30 Evitts Creek Water Co.,		New,		
31 Falls Creek Borough,	Built 1911 without approval.			

WATER FILTER DESIGNS MADE THE SUBJECTS OF PERMITS OR DECREES—Continued.

	Water Works Owner.	Type of Filter Plant.			
		Slow Sand.	Mechanical.		Miscellaneous.
			Gravity.	Pressure.	
32	Franklin City, plant purchased from Venango Water Co.,		New and remodeled,		
33	Freeport Water Works Co.,		New,		
34	Gettysburg Water Co.,		Addition,		
	Gravel Hill Water Supply Co. (Supply from Lebanon Valley Consolidated Water Supply Co.)				
35	Greenville Water Co.,		New,		
36	Hanover and McSherrystown Water Co.,				Old, vertical.
37	Harrisburg City,		Old,		
38	Haysville Water Co.,			New,	
39	Hershey Water Co.,		New,		
40	Hummelstown Consolidated Water Co.,		New,		
41	Huntingdon Water Supply Co.,				Addition, semi-slow.
	Jenkintown Water Co. (Supply from Moreland Spring Water Co.				
42	Kensington Water Co.,		New,		
	Lancaster City—supply filtered by—				
43	Lancaster Water Filtration Co.,				Old, semi-slow.
44	Latrobe Water Co.,		New,		
45	Lebanon Valley Consolidated Water Supply Co.,		New,		
46	Lehigh Water Co.,				Old crib.
47	McKeesport City,		New,		
	Manheim Township Water Co. (Supply from Lancaster),				
48	Marianna Water Co.,		New,		
49	Masontown Borough,		New,		
50	Mechanicsburg Gas and Water Co.,		New,		
51	Middletown and Swatara Consolidated Water Co.,		New,		
52	Midland Water Co.,		New,		
53	Monessen Water Co. (now Tri-Cities Water Co.),		Abandoned,		
	Plant purchased from Charleroi Water Co.,		Addition,		
54	Montgomery Water Co.,		New,		
	Moore Water Co. (Supply from Suburban Co. of Allegheny County, Pa.)				
55	Moreland Spring Water Co.,		New,		
56	Muncy Water Supply Co.,				Strainer, not built.
57	Myerstown Water Co.,			Not built,	
58	Natrona Water Co.,		New,		
59	New Chester Water Co.,		Addition,		
60	New Oxford Borough,		New,		
61	Newport Home Water Co.,		New,		
62	Norristown Insurance and Water Co.,		Addition,		

North Annville Water Supply Co. (Supply from Lebanon Valley Consolidated Water Supply Co.)			
North Cornwall Water Supply Co. (Supply from Lebanon Valley Consolidated Water Supply Co.)			
63 North East Borough,			New,
64 North Strabane Water Co.,		Built 1910 without approval.	
Ogontz Water Co. (Supply from Moreland Spring Water Co.),			
65 Parker City Water Co.,		New,	
66 Pennsylvania Industrial Reformatory (near Huntingdon),			New (not domestic supply).
67 Pennsylvania Training School, Morganza,	Preliminary plan,		
68 Pennsylvania Water Co.,		New,	
69 Perkasie Water Supply Co.,		New,	
70 Phoenixville Borough,		New,	
71 Pittsburgh City,	Addition,		
72 Pittsburgh Coal Co.,		New,	
73 Pottstown Gas and Water Co.,		New,	
74 Punxsutawney Water Co.,			New,
75 Quarryville Water Co.,		New,	
76 Reading City,	2 Old,		
	2 New,		
77 Ridgway Borough,		New,	
78 Riverton Consolidated Water Co.,		New,	
79 Schuylkill Haven Gas and Water Co.,		Not built,	Disapproved and not built.
80 Scranton Gas and Water Co.,		New,	
81 Sharon Water Works Co.,		Old,	
South Annville Water Supply Co. (Supply from Lebanon Valley Consolidated Water Supply Co.)			
82 South Fork Water Co.,		Not built,	
83 South Pittsburgh Water Co.,		Old,	
84 Spring Brook Water Supply Co., Hunlsville Plant,		Old,	
85 Springfield Consolidated Water Co. (also operates),			New,
North Springfield Water Co.,	Remodeled,	Remodeled,	
86 Springfield Water Co.,			Remodeled,
87 State Asylum for Chronic Insane of Pennsylvania, Wernersville.		New,	
88 State Hospital for the Insane (near Danville),		Addition,	
89 State Institution for Feeble-Minded of Western Pennsylvania, Polk.		Preliminary plan,	
90 Steelton Borough,	New, with scrubbers,		
91 Suburban Water Co. of Allegheny Co., Pa.,		Preliminary plan,	
92 Sunbury Water Co.,		Old,	
93 Tarentum,		New,	
94 Tarentum Water Co. (Purchased in 1906 by Allegheny Valley Water Co.)		New,	
95 Troy Borough,	Preliminary plan,		
Unity Water Co. (Supply from Suburban Water Co. of Allegheny County, Pa.)			

WATER FILTER DESIGNS MADE THE SUBJECTS OF PERMITS OR DECREES—Continued.

	Water Works Owner.	Type of Filter Plant.			
		Slow Sand.	Mechanical.		Miscellaneous.
			Gravity.	Pressure.	
	Valley Forge Park Commissioners. (Supply from Springfield Consolidated Water Co.)				
	Venango Water Co. (Purchased by Franklin City),				
96	Warren Water Co.,		New,		
	Weldon Water Co. (Supply from Moreland Spring Water Co.)				
97	West Conshohocken Water Co.,		New,		
	West Norriton Water Co. (Supply from Norristown Insurance and Water Co.)				
98	West Pittsburgh Water Co.,		New,		
99	York County Consolidated Water Co.,		New,		
100	York Water Co.,		Addition,		

SUMMARY OF WATER FILTER DESIGNS MADE THE SUBJECTS OF PERMITS OR DECREES.

	Type of Plant.						
		Mechanical.					
	Slow sand.	Gravity.	Pressure.	Semi-slow.	Crib only.	Strainers.	All types.
Old plants:							
Unchanged,	3	10	6	2	1	1	17
Extended,	1	8	0	1	0	0	10
Remodeled,	1	3	1	0	0	0	5
New plants,	1	52	7	0	0	0	63
Preliminary design,	3	4	0	0	0	0	7
Not built,	0	3	2	0	0	1	6
Abandoned,	0	1	0	0	1	0	2
Total,	12	81	16	3	2	2	110

From the above table it appears that the mechanical or rapid type of filter predominates in favor and, further, that the unreliability of the old cribs and strainers to furnish a safe supply from polluted sources is being recognized. Under the heading "Strainers" are grouped crude filter designs, so-called, which cannot be included in any of the generally recognized type groups. It should be noted that none of these crude types of design is shown in the above table for new construction. Moreover, there are no cribs among the new designs, although this form of construction was viewed with favor not many years ago as a protective measure in obtaining water supplies from surface streams.

SEWERAGE.

10. SEWERAGE AND SEWAGE DISPOSAL PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH.

The issuing of sewerage and sewage disposal permits and decrees has been done under Act 182 of 1905, as interpreted by the Governor of the State, the Attorney General and the Commissioner of Health, acting together under the law, or by the Courts upon appeal. This law is a distinct departure in Pennsylvania State Medicine, in that it provides for State prevention of water-borne diseases. Formerly the powers committed by statute to the State Board of Health relative to regulations tending to limit the spread of infection by water carriage were advisory only. It was at all times within the sphere and duty of the Board to recommend to local authorities, having the

usual powers in matters relating to the preservation of public health, the adoption of effective sanitary and preventive regulations and measures in anticipation of possible future epidemics.

The policy of limiting the State health authorities to powers of an advisory character only, until the actual presence of an epidemic threatens everybody in the community, so vividly shown to be suicidal in the extreme by the memorable epidemic of 1903-04 at Butler, ceased with the enactment of the law of 1905. In the prosecution of the work under this new law, precedents have had to be established. It has been pioneer effort.

Sewage is defined in the Act as "any substance that contains any of the waste products or excrementitious or other discharges from the bodies of human beings or animals." Slops, sink and wash water come within the meaning of the term. The prevailing idea that laundry water and drainage from bath-tubs is not sewage is gradually being dispelled; but not without some educational effort in making clear that such waters very frequently contain pathogenic poison, and that they are often discharged to the surface of the ground near springs and wells, or into street gutters, and thence to streams used below as sources of public water supply. Some manufacturing wastes are not sewage as above defined but if a menace to public health they are subject to regulation at the discretion of the Commissioner of Health.

The law stipulates that no person, corporation or municipality shall place or permit to be placed or discharge or permit to flow into any of the waters of the State any sewage except as specially provided; but the Act does not apply to waters pumped or flowing from coal mines or tanneries. Neither does it prevent the discharge of sewage from any public sewer system owned and maintained by a municipality, provided such sewer system was in operation and was discharging sewage into any State waters at the time of the passage of the Act. The exception noted, however, does not permit the discharge of sewage from a sewer system extended subsequent to the passage of the Act. A copy of the law has been sent to every municipality.

Therefore it is understood that so long as a municipal sewer system in use before April 22nd, 1905, be not extended, the law is not applicable and the sewage therefrom may continue to defile the public water supply. What constitutes an extension has been the subject of considerable contention by local officials. A sewer system must, in the course of events, be extended. Department officers and agents have been instructed that evidently the intent of the law is to bring, as soon as possible, all municipal sewer systems under State regulation and control, to the end that the purifying of the waters of the State for the protection of the public health shall be accomplished.

Unapproved sewer extensions to an existing sewer outlet whereby the volume of filth discharged into a stream is quadrupled would defeat the object of the law and be contrary to the letter thereof. It is understood that the State officials have determined that it is the principle involved which shall control and not the length of the sewer extension.

The law further provides that upon application duly made to the Commissioner of Health by public authorities having by law charge of a sewer system of any municipality, the Governor, Attorney General, and Commissioner of Health, shall consider the case and whenever it is their unanimous opinion that the general interests of the public health would be subserved thereby, the Commissioner of Health may issue a permit for the discharge of sewage from such public sewer system into any of the waters of the State and may stipulate in the permit the conditions on which discharge will be permitted. The permit before being operative must be recorded in the office of the Recorder of Deeds for the county wherein the outlet for the sewer system is located.

As understood, the policy inaugurated is to bring about the abandonment of streams as carriers of raw sewage. All sewage must finally cease to be discharged, untreated, into any waters used subsequently for drinking purposes.

It also appears by what follows that a town should avoid the making of a petition every time a petty sewer exension is contemplated, by the submission in the first instance of a general application for sewer extension, involving the question once for all of State policy for that particular municipality. State approval under these circumstances implies careful consideration of all the problems involved. The principal one relates to the disposition of the sewage.

A private corporation, duly chartered by the State, and enfranchised by local authorities to construct, operate and maintain a public sewer system according to an opinion of Attorney General Carson, is to be classed with the municipal corporations to the extent that plans must be filed and extensions approved. All other private corporations and companies and individuals that at the time of the passage of the act, were discharging sewage into any of the waters of the State, may continue such discharge unless otherwise ordered. In a borough the remedy for the sources of pollution may be connection with a public sewerage system.

The student of the permits may note that one feature is based on the proposition that it is not practicable to treat large volumes of mingled sewage and storm water, owing to the prohibitive cost. It is really always more economical and better to build separate sewers for sanitary household drainage and to provide other channels for the removal of rain water.

Another feature is based on the proposition that efficiency and economy in preserving the purity of streams for the public protection dictate that sewers shall be built to conform to a comprehensive plan. It is now generally recognized that patchwork methods are bound to cause trouble, expensive alterations and repairs, and that those towns which have employed competent consulting engineers to lay out comprehensive systems and have thereafter conformed to the plan in construction, have usually found such a course to be profitable.

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH, WITH THE APPROVAL OF THE GOVERNOR AND THE ATTORNEY GENERAL, DURING 1913.

During the year, one hundred and nine sewerage permits and decrees have been issued and it should be noted that, as in the case of water works, every permit is a decree but every decree is not a permit. These permits and decrees include seventy-one permits for the temporary discharge of sewage untreated into State waters; seventeen approvals of plans for sewage treatment works, in addition to sixteen approvals of sewage treatment plans contained in temporary permits; three decrees rejecting sewerage plans or withholding approval thereof until sewage treatment plans are prepared; one decree rejecting sewage treatment plans; and fifteen decrees requiring the preparation of sewage treatment plans to be taken up at once. Two special permits were issued to the borough of Washington for petty sewer extensions to its system, discharging to the sewage treatment works already approved by the Department. One permit, issued to the borough of Jeannette, was not accepted.

Of the seventy-one permits for the temporary discharge of sewage untreated into State waters:

Seven expire within six months and require the submission of sewage treatment plans within that time, namely, those issued to Arnold, Brownsville, Edwardsville (2 permits), John Hamilton of State College, Shenandoah, and South Brownsville.

Twenty expire within one year, namely, those issued to Athens, Coraopolis, Erie, Lewisville, North East, Philadelphia (14 permits) and the Pittsburgh-Buffalo Company of Marianna.

Twenty-eight expire within two years, namely, those issued to Cambridge Springs, Carbondale, Charleroi, Collier Land Company, Collingdale, Colwyn, Coudersport, Darby, East Lansdowne, Glenolden, Greenville, (2 permits), Kane, Lansdowne, Millbourne, North

Charleroi, Norwood, Parkesburg, Prospect Park, Renovo, Ridley Park, Sharon, Sharon Hill, Springdale, Uniontown, Upper Darby Township, Wyoming, and Yeadon.

Eleven expire within three years, namely, those issued to Avalon, Bedford, Blairsville, Corry, Homestead, Meyersdale, Mt. Lebanon Township (2 permits), Parsons, Towanda, and Union City.

Three expire within four years, namely, those issued to Duquesne, East McKeesport and Edinboro.

Two provide for the temporary discharge of sewage until its treatment becomes necessary, although no definite date of expiration is given in the permits, namely, that to the Nazareth Sewerage Company (for partially treated sewage) and that to North Braddock, which requires the submission of sewage treatment plans on order.

Seventeen permits and decrees approving plans for sewage treatment works were issued to the following:

1. Altoona (eastern district).
2. Bristol.
3. Farrell.
4. Hillside Home, Scranton Poor District.
5. House of Employment of Delaware County.
6. Jeannette.
7. Lansdale.
8. Ligonier (First Permit).
9. Ligonier (Second Permit).
10. Middle Coal Field Poor District.
11. Norristown.
12. Philadelphia (Night Soil Disposal Plant).
13. Philadelphia Rapid Transit Company, Willow Grove Park.
14. Seybert Institution, Abington Township, Montgomery County.
15. State College (to use Penna. State College plant temporarily).
16. Vesta Coal Company, East Bethlehem Township, Washington County.
17. York.

Numbers 7, 11, 16, and 17 of the above permits and decrees require modification of sewage treatment plans to be re-submitted for final approval. The above list is in addition to approvals of sewage treatment plans given in a number of instances in permits for the temporary discharge of crude sewage.

The three decrees rejecting or withholding approval of sewer plans were issued to Clifton Heights, Elizabethville, and Hanover Township, Luzerne County.

The fifteen decrees requiring the immediate preparation of plans for sewage treatment works were issued to

1. Beaver Falls (First Decree).
2. Beaver Falls (Second Decree).
3. Butler-Highfields Land and Improvements Company.
4. Canton.
5. Claysville.
6. Edinboro (First Decree).
7. Jersey Shore.
8. Ligonier (Second Decree).
9. Lock Haven.
10. Mt. Lebanon Township (First Decree).
11. New Kensington
12. South Renovo.
13. Swarthmore.
14. Tarentum.
15. West Newton.

EXPLANATION OF THE FOLLOWING TABLE OF ALL SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH UP TO DECEMBER 31ST, 1913.

There have been 799 sewerage and sewage disposal permits and decrees issued since the creation of the State Department of Health, several for the same place in a number of instances. The places served comprise 352 municipalities, cities, boroughs, and townships, numbered consecutively in alphabetical order in the first column of the following table. Where the recipients are the municipalities, they are followed by consecutive numbers in the narrow second column headed "Numbering of Municipal Owners." Where the recipients are private corporations, individuals, or institutions, their names are given in the third column opposite the municipalities in which the system is located. These private parties are also entered in this column alphabetically, with consecutive numbers and with cross references, opposite in the first column, to the municipalities. The permits and decrees, and years of issue, are indicated opposite the alphabetical entries. A few post-offices, stations, and popular names are also entered alphabetically in the first column, without numbers, to facilitate reference.

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL, AND PLACES SERVED, 1905-1913.

Numbering of municipalities.	PLACES SERVED. Municipalities numbered alphabetically; also again entered opposite alphabetical entries of Non-municipal Recipients.	RECIPIENTS OF PERMITS AND DECREES. Numbering of municipal owners.	Private Corporations, Individuals and Institutions. Numbered alphabetically; also again entered opposite alphabetical entries of Places Served.	Permits and Decrees by Years opposite numbered entries of Recipients. 1905 & 1906	1907	1908	1909	1910	1911	1912	1913	Total
				51	86	129	114	111	80	119	109	799
1	Abington Township, Montgomery Co., ...		Seybert Institution, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	Aldan, Delaware Co., ...	1	.....	.....	.....	.....	.....	.....	.....	1	.....	1
3	Aliquippa, Beaver Co., ...	2	.....	.....	2	.....	.....	1	.....	.....	.....	3
	O'Hara Township, Allegheny Co., ...		1 Allegheny City Home, ...	.....	1	1	.....	.....	.....	.....	.....	2
	Collier Township, Allegheny Co., ...		2 Allegheny County Home & Hosp. for Insane,	.....	.....	.....	.....	.....	1	.....	.....	1
	O'Hara Township, Allegheny Co., ...		3 Allegheny County Work House, ...	.....	1	.....	.....	.....	.....	.....	.....	1
4	Allentown, Lehigh Co., ...	3	.....	.....	.....	1	.....	.....	.....	.....	.....	1
5	Altoona, Blair Co., ...	4	.....	.....	.....	.....	.....	.....	.....	.....	1	1
	Carroll Township, Washington Co., ...		4 American Steel & Wire Co., Donora, ...	.....	.....	.....	.....	1	.....	.....	.....	1
6	Arnold, Westmoreland Co., ...	5	.....	.....	.....	.....	.....	.....	.....	.....	1	1
7	Ashley, Luzerne Co., ...	6	.....	.....	.....	.....	.....	.....	.....	1	.....	1
	O'Hara Township, Allegheny Co., ...		5 Aspinwall-Delafield Company, ...	1	.....	.....	.....	.....	.....	.....	.....	1
8	Athens, Bradford Co., ...	7	.....	.....	.....	.....	.....	.....	.....	1	1	2
9	Avalon, Allegheny Co., ...	8	.....	.....	.....	.....	.....	.....	.....	.....	1	1

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

Numbering of municipalities.	PLACES SERVED. Municipalities numbered alphabetically; also again entered opposite alphabetical entries of Non-municipal Recipients.	RECIPIENTS OF PERMITS AND DECREES. Numbering of municipal owners.	Private Corporations, Individuals and Institutions. Numbered alphabetically; also again entered opposite alphabetical entries of Places Served.	Permits and Decrees by Years opposite numbered entries of Recipients. 1905 & 1906	1907	1908	1909	1910	1911	1912	1913	Total
10	Avoca, Luzerne Co.,	9					1					1
11	Baden, Beaver Co.,	10			1							1
12	Baldwin Township, Allegheny Co.,		West Liberty Improvement Co.,									
13	Barnesboro, Cambria Co.,	11				1						1
14	Barrett Township, Monroe Co.,		Buck Hill Falls Company,									
15	Bath, Northampton Co.,	12						1				1
16	Beaver, Beaver Co.,	13				1						1
17	Beaver Falls, Beaver Co.,	14					1			2	2	5
18	Bedford, Bedford Co.,	15			1		1				1	3
	Haverford Township, Delaware Co.,		6 Beechwood Park Amusement Co.,			1						1
19	Bellefonte, Centre Co.,	16				1						1
20	Bellevernon, Fayette Co.,	17						1				1
21	Bellevue, Allegheny Co.,	18					1		1			2
22	Ben Avon, Allegheny Co.,	19				1						1
	Kilbuck Township, Allegheny Co.,		7 Ben Avon Heights Sewer Co.,						1			1
23	Bensalem Township, Bucks Co.,		St. Francis Industrial School, Eddington,									
	Heidelberg Township, Berks Co.,		8 Bethany Orphans Home,						1			1

24	Big Beaver Township, Beaver Co.,		Koppel Land Co.,								
25	Big Run, Jefferson Co.,	20			1						1
26	Blairsville, Indiana Co.,	21			1		1			1	3
27	Blakely, Lackawanna Co.,	22		1			1				2
	O'Hara Township, Allegheny Co.,		9 Blaw Steel Centering Company,						1		1
28	Bloomsburg, Columbia Co.,	23		1							1
29	Brackenridge, Allegheny Co.,	24				2	1				3
30	Braddock Township, Allegheny Co.,		East Wilkinsburg Improvement Co.,								
31	Bradford, McKean Co.,	25				1			1		2
32	Bristol, Bucks Co.,	26			1			1		1	3
	E. Stroudsburg, Monroe Co.,		10 Brittain, A. R., et. al.,					1			1
33	Brownsville, Fayette Co.,	27					1		1	1	3
	Moreland Township, Montgomery Co.,		11 Bryn Athyn Village Association,			2					2
	Barrett Township, Monroe Co.,		12 Buck Hill Falls Company,						1		1
34	Burrell Township, Indiana Co.,		Josephine Furnace & Coke Co.,								
35	Butler, Butler Co.,	28			1				2		3
36	Butler Township, Butler Co.,		13 Butler-Highfields Land & Imp. Co.,							1	1
37	Canaan Township, Wayne Co.,		State Hosp. for Criminal Insane, Farview Station.								
38	California, Washington Co.,	29				1					1
39	Cambridge Springs, Crawford Co.,	30			1	2	1			1	5
40	Canonsburg, Washington Co.,	31				1					1
41	Canton, Bradford Co.,	32			1					1	2
42	Carbondale, Lackawanna Co.,	33					2	1		1	4
43	Carbondale Township, Lackawanna Co.,		Mayfield Yards (Citizens),								
44	Carlisle, Cumberland Co.,	34			2						2
45	Carmichaels, Greene Co.,	35						1			1
46	Carrick, Allegheny Co.,	36		1		1					2

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

Numbering of municipalities.	PLACES SERVED. Municipalities numbered alphabetically; also again entered opposite alphabetical entries of Non-municipal Recipients.	RECIPIENTS OF PERMITS AND DECREES. Numbering of municipal owners.	Private Corporations, Individuals and Institutions. Numbered alphabetically; also again entered opposite alphabetical entries of Places Served.	Permits and Decrees by Years opposite numbered entries of Recipients. 1905 & 1906	1907	1908	1909	1910	1911	1912	1913	Total
47	Carroll Township, Washington Co., ...		American Steel & Wire Co., Donora, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
48	Cecil Township, Washington Co., ...		Penna. Training School, Morganza, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
49	Chambersburg, Franklin Co., ...	37	.....	.....	1	.....	.....	.....	1	.....	.....	2
50	Chapman Township, Clinton Co., ...		Drocton Land Co., Renovo, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
51	Charleroi, Washington Co., ...	38	.....	.....	.....	.....	.....	1	.....	.....	1	2
52	Chartiers Township, Allegheny Co., ...	39	.....	.....	2	.....	.....	.....	.....	.....	.....	2
53	Chester, Delaware Co., ...	40	.....	.....	.....	1	.....	1	.....	.....	.....	2
	West Bradford Township, Chester Co.,		14 Chester Co. Home & Hosp. for the Ins., ...	.....	.....	.....	.....	.....	.....	1	.....	1
	West Pikeland Township, Chester Co.,		15 Chester Springs Soldiers Orph. School, ...	.....	.....	.....	1	.....	.....	.....	.....	1
54	Cheswick, Allegheny Co., ...	41	.....	.....	.....	3	.....	2	.....	1	.....	6
55	Clairton, Allegheny Co., ...	42	.....	.....	.....	.....	.....	.....	1	.....	.....	1
56	Claysville, Washington Co., ...	43	.....	.....	.....	.....	.....	.....	.....	.....	1	1
57	Clearfield, Clearfield Co., ...	44	.....	.....	.....	1	1	.....	.....	.....	.....	2
58	Clifton Heights, Delaware Co., ...	45	.....	.....	.....	.....	.....	.....	.....	.....	1	1
59	Clintonville, Venango Co., ...	46	.....	.....	.....	1	.....	.....	.....	.....	.....	1
60	Coaldale, Schuylkill Co., ...	47	.....	.....	1	1	.....	.....	.....	.....	.....	2
61	Coatesville, Chester Co., ...	48	.....	.....	.....	.....	.....	.....	.....	1	.....	1

62	College Hill, Beaver Co.,	49				1			1		2
	College Hill, Beaver Co.,		Whiteside, Robt. A.,								
63	Collier Township, Allegheny Co.,		Allegheny County Home & Hosp. for Insane.								
	Collier Township, Allegheny Co.,		16 Collier Land Co.,							1	1
64	Collingdale, Delaware Co.,	50							2	1	3
65	Columbia, Lancaster Co.,	51		1	1						2
66	Columbus Township, Warren Co.,		Howard, J. W. & A. P., & Co., Ltd., Corry.								
67	Colwyn, Delaware Co.,	52			1		1			1	3
68	Conewango Township, Warren Co.,		State Hosp. for Insane, Warren,								
69	Connellsville, Fayette Co.,	53			1	1					2
70	Coraopolis, Allegheny Co.,	54		1						1	2
71	Corry, Erie Co.,	55			1		1		1	1	4
	Corry, Erie Co. (vicinity),		Howard, J. W. & A P., & Co., Ltd., Columbus Twp. (Warren county).								
72	Coudersport, Potter Co.,	56					1			1	2
73	Crafton, Allegheny Co.,	57						1			1
	Perkasie, Bucks Co.,		17 Cressman, Philip,			3					3
74	Cresson, Cambria Co.,	58		1							1
75	Danville, Montour Co.,	59			2		1	2			5
	Danville, Montour Co. (vicinity),		State Hosp. for Insane, Mahoning Twp.,								
76	Darby, Delaware Co.,	60			1		1			1	3
	Darling P. O.,		Glen Mills Schools, Girls' Department,								
77	Dayton, Armstrong Co.,	61							1		1
	Middletown Township, Delaware Co.,		18 Delaware County House of Employment,							1	1
	Dormont, Allegheny Co.,		19 Delmont Land Co. (Permit '09.) (In part of Scott Twp. Annxd. later to Dormont in 1909.)								
	Springfield Township, Delaware Co.,		20 Dermady Sanatorium (Near Morton),	1							1

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

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78	Derry, Westmoreland Co.,	62			1	2						3
	Easttown Township, Chester Co.,		21 Devon (Citizens),			1						1
79	Dickson City (borough), Lackawanna Co.,	63				1						1
	Dixmont, Allegheny Co.,		W. Penna. Hosp. for the Insane (Kilbuck Twp.)									
80	Donora, Washington Co.,	64					1			1		2
	Donora, Washington Co. (vicinity),		American Steel & Wire Co. (Carroll Twp.)									
81	Dormont, Allegheny Co.,	65	Delmont Land Co. (Permit '09). (Annexed later in '09 to Dormont.)				1*	2				3
82	Dorranceton, Luzerne Co.,	66				1			1			2
83	Doylestown, Bucks Co.,		22 Doylestown Sewerage Company,				1	1				2
	Chapman Township, Clinton Co.,		23 Drocton Land Co., Renovo,	1								1
84	DuBois, Clearfield Co.,	67					1					1
85	Duquesne, Allegheny Co.,	68									1	1
86	Dunmore, Lackawanna Co.,	69			1							1
87	Duryea, Luzerne Co.,	70								2		2
	Scott Township, Allegheny Co.,		24 Dysart, A. P.,			1						1
88	Eagles Mere, Sullivan Co.,	71				1						1

	Eagleville P. O.,		Phila. Jewish Sana. (L. Providence Twp.),	.....	.....	.....	.....	.....	.....	.....	.....	.....
89	East Bethlehem Township, Washington Co.		Vesta Coal Co.,	.....	.....	.....	.....	.....	.....	.....	.....	.....
90	East Brady, Clarion Co.,	72	.....	1	.....	.....	.....	.....	.....	.....	.....	1
	Sunbury, Northumberland Co.,		25 East End Sewer Co.,	1	.....	.....	.....	.....	1	.....	.....	2
	East Vincent Township, Chester Co.,		26 East. Penna. State Inst. for Feeble-Minded and Epileptic, near Spring City.	1	.....	.....	.....	.....	.....	1	.....	2
91	East Lansdowne, Delaware Co.,	73	.....	.....	.....	.....	.....	.....	.....	1	1	2
92	East McKeesport, Allegheny Co.,	74	.....	.....	1	.....	.....	.....	.....	1	1	3
93	East Mauch Chunk, Carbon Co.,	75	.....	.....	1	.....	.....	.....	.....	.....	.....	1
94	Easton, Northampton Co.,	76	.....	1	.....	.....	1	2	.....	.....	.....	4
95	East Stroudsburg, Monroe Co.,	77	.....	.....	.....	1	.....	.....	.....	.....	.....	1
	East Stroudsburg, Monroe Co.,		Brittain, A. R., et al.,	.....	.....	.....	.....	.....	.....	.....	.....	.....
96	Easttown Township, Chester Co.,		Devon (Citizens),	.....	.....	.....	.....	.....	.....	.....	.....	.....
97	East Vincent Township, Chester Co.,		East. Penna. State Inst. for F. M. & E. near Spring City.	.....	.....	.....	.....	.....	.....	.....	.....	.....
98	East Washington, *Permit jointly with Washington.	78	.....	.....	.....	.....	.....	.....	*	.....	.....	*
	Braddock and Wilkins Townships, Allegheny Co.		27 East Wilkinsburg Improvement Co.,	.....	.....	.....	.....	1	.....	.....	.....	1
	Eddington P. O.,		St. Francis Ind. School (Bensalem Twp.),	.....	.....	.....	.....	.....	.....	.....	.....	.....
99	Eddystone, Delaware Co.,	79	.....	.....	.....	.....	.....	.....	.....	1	.....	1
100	Edgeworth, Allegheny Co.,	80	.....	1	1	.....	.....	.....	.....	.....	.....	2
101	Edinboro, Erie Co., *Permits jointly to borough and Northwestern State Normal School.	81	.....	.....	1	.....	.....	.....	.....	1	*	4
102	Edwardsville, Luzerne Co.,	82	.....	.....	.....	1	.....	.....	.....	1	2	4
103	Elizabethville, Dauphin Co.,	83	.....	.....	.....	.....	.....	.....	.....	.....	1	1
	Lower Allen Township, Cumberland Co.,		28 Elkwood Sewer Co., New Cumberland,	.....	.....	.....	.....	.....	1	.....	.....	1
104	Elkwood City (borough), Lawrence Co.,	84	.....	.....	1	1	.....	.....	.....	.....	.....	2
	Elwyn P. O.,		Penn'a Training School F. M. C. (Middletown Twp.)	.....	.....	.....	.....	.....	.....	.....	.....	.....

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

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105	Emlenton, Venango Co.,	85		.....	.....	1	.....	.....	.....	.....	.....	1
106	Emporium, Cameron Co.,	86		1	.....	.....	.....	1	.....	.....	.....	2
107	Emsworth, Allegheny Co.,	87		1	.....	.....	.....	.....	.....	.....	.....	1
108	Erie, Erie Co.,	88		.....	.....	.....	1	1	.....	1	1	4
	Mill Cr. & Harbor Cr. Townships, Erie Co.		29 Erie Improvement Co.,	.....	.....	1	.....	.....	1	1	.....	3
109	Etna, Allegheny Co.,	89		.....	.....	.....	1	.....	.....	1	.....	2
110	Evansburg, Butler Co. (Evans City P. O.),	90		.....	.....	.....	.....	.....	.....	.....	1	1
111	Everson, Fayette Co.,	91		.....	.....	.....	.....	.....	1	1	.....	2
112	Exeter, Luzerne Co.,	92		.....	.....	1	.....	.....	.....	.....	.....	1
113	Fairchance, Fayette Co.,	93		.....	.....	1	.....	.....	.....	.....	.....	1
	Leet Township, Allegheny Co.,		30 Fair Oaks Land Company,	.....	.....	1	.....	.....	.....	.....	.....	1
114	Farrell, Mercer Co.,	94		.....	.....	1	.....	.....	.....	1	1	3
	Farview Station, Wayne Co.,		State Hosp. for Crim. Ins. (Canaan Twp.)	.....	.....	.....	.....	.....	.....	.....	.....	.....
115	Ford City (borough), Armstrong Co.,	95		.....	2	.....	.....	.....	.....	.....	.....	2
116	Forest City (borough), Susquehanna Co.,	96		.....	1	1	.....	.....	.....	.....	.....	2
117	Forty Fort, Luzerne Co.,	97		.....	.....	.....	.....	.....	.....	1	.....	1
118	Franklin, Venango Co.,	98		.....	.....	1	1	.....	.....	1	.....	3

119	Freeport, Armstrong Co.,	99				1				1		2
120	Gaysport, Blair Co.,	100		1								1
121	Gilberton, Schuylkill Co.,	101							1			1
122	Glassport, Allegheny Co.,	102				1		1	1			3
	Thornbury Township, Delaware Co.,		31 Glen Mills Schools, Boys' Dept. Glen Mills (Formerly House of Refuge).							2		2
	Middletown Township, Delaware Co.,		32 Glen Mills Schools, Girls' Dept., Darling,			1						1
123	Glenolden, Delaware Co.,	103								1	1	2
	Norwich Township, McKean Co.,		33 Goodyear Lumber Co. (Now Norwich Lumber Co.)						2			2
124	Green Tree, Allegheny Co.,	104					1					1
125	Greenville, Mercer Co.,	105		1	1						2	4
126	Grove City (borough), Mercer Co.,	106				1	1					2
127	Hallstead, Susquehanna Co.,	107		1								1
	State College, Centre Co.,		34 Hamilton, John (permit for part of College Twp., later annexed to Borough).				1				1	2
128	Hanover, York Co.,		35 Hanover Sewer Co.,				1					1
129	Hanover Township, Lehigh Co.,		Homoeo. State Hosp. for Ins., Rittersville,									
130	Hanover Township, Luzerne Co.,	108									1	1
131	Harbor Creek Township, Erie Co.,		Erie Improvement Co.,									
132	Harrisburg, Dauphin Co.,	109		1	1		2		2			6
	Harrisburg, Dauphin Co. (vicinity),		Penna. State Luna. Hosp. (Susquehanna Twp.)									
	Harrisburg, Dauphin Co. (vicinity),		Susquehanna Drainage Co. (Susquehanna Twp.)									
133	Harrison Township, Allegheny Co.,	110			1							1
134	Hastings, Cambria Co.,	111					1	1		1		3
135	Haverford Township, Delaware Co.,		Beechwood Park Amusement Co.,									
	Haverford Township, Delaware Co.,		36 Haverford College,			1						1
136	Hazleton, Luzerne Co.,	112					1	1	1	1		4

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

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137	Heidelberg Township, Berks Co.,		Bethany Orphans Home,	.....	.....	.....	.....	.....	.....	.....	.....	.....
138	Hempfield Township, Westmoreland Co.,		State Police Barracks, near Greensburg,	.....	.....	.....	.....	.....	.....	.....	.....	.....
139	**Hollidaysburg**, Blair Co.,	113		1	.....	.....	.....	.....	.....	.....	.....	1
	Radnor Township, Delaware Co.,		37 Home & Hosp. of the Good Shepherd,	.....	.....	.....	.....	.....	1	.....	.....	1
	Hanover Township, Lehigh Co.,		38 Homoeo. State Hosp. for the Insane, Rittersville.	.....	.....	1	.....	.....	.....	.....	.....	1
140	Homestead, Allegheny Co.,	114		.....	.....	.....	.....	.....	.....	1	1	2
141	Hopewell Township, Beaver Co.,		Jones & Laughlin Steel Co. (Sewers taken over by Woodlawn inc. 1909.)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Middletown Township, Delaware Co.,		House of Refuge of E. Penna. Now Glen Mills Schools q. v.	.....	.....	.....	.....	.....	.....	.....	.....	.....
142	Hontzdale, Clearfield Co.,	115		.....	.....	1	.....	1	.....	1	.....	3
	Columbus Township, Warren Co.,		39 Howard, J. W. & A. P., & Co., Ltd., near Corry.	.....	.....	1	.....	.....	.....	.....	.....	1
143	Hughesville, Lycoming Co.,	116		.....	.....	1	.....	.....	.....	1	.....	2
144	Huntingdon, Huntingdon Co.,	117		.....	.....	1	.....	.....	.....	.....	.....	1
	Huntingdon, Huntingdon Co. (vicinity),		Penna. Ind. Ref. (Smithfield Twp.),	.....	.....	.....	.....	.....	.....	.....	.....	.....
145	Indiana, Indiana Co.,	118		.....	2	1	.....	.....	.....	.....	.....	3
146	Jeannette, Westmoreland Co.,	119		.....	1	.....	1	1	.....	.....	1	4
	Pine Creek Township, Jefferson Co.,		40 Jefferson County Commissioners,	.....	.....	.....	.....	1	.....	.....	.....	1

147	Jenkintown, Montgomery Co.,	120							2		2
148	Jersey Shore, Lycoming Co.,	121							2	1	3
149	Johnsonburg, Elk Co.,	122		2					1		3
	Woodlawn, Beaver Co.,		41 Jones & Laughlin Steel Co. (Sewers in Hopewell Twp. taken over by Woodlawn, Inc. in 1909.)		1						1
	Burrell Township, Indiana Co.,		42 Josephine Furnace & Coke Co.,				1				1
150	Kane, McKean Co.,	123		3	1				1	1	6
151	Kilbuck Township, Allegheny Co.,		West. Penna. Hosp. for Ins., Dixmont,								
	Kilbuck Township, Allegheny Co.,		Ben Avon Heights Sewer Co.,								
152	Kingston, Luzerne Co.,	124		1							1
153	Kittanning, Armstrong Co.,	125			1						1
154	Knoxville, Tioga Co.,	126				1					1
	Big Beaver Township, Beaver Co.,		43 Koppel Land Co.,			2					2
155	Lancaster, Lancaster Co.,	127		1	3	2		1			7
156	Lansdale, Montgomery Co.,	128								1	1
157	Lansdowne, Delaware Co.,	129			1		1			1	3
158	Lansford, Carbon Co.,	130		1							1
159	Lebanon, Lebanon Co.,	131						1			1
160	Leet Township, Allegheny Co.,		Fair Oaks Land Co.,								
	S. Whitehall Township, Lehigh Co.,		44 Lehigh County Commissioners,					1			1
161	Lehighton, Carbon Co.,	132						1			1
162	Lehigh Township, Carbon Co.,		Middle Coal Field Poor Dist.,								
163	Lewisburg, Union Co.,	133		1			1				2
164	Lewistown, Mifflin Co.,	134					1				1
165	Lewisville, Potter Co. (Ulysses P. O.),	135								1	1
166	Ligonier, Westmoreland Co.,	136		1					3		3
167	Lock Haven, Clinton Co.,	137							1	1	2
168	Lower Allen Township, Cumberland Co.,		Elkwood Sewerage Co., New Cumberland,								

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

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169	Lower Burrell Township, Westmoreland Co.		Valley Camp Association,									
170	Lower Heidelberg Township, Berks Co.,		State Asylum for Chronic Insane, Wernersville.									
171	Lower Merion Township, Montgomery Co.	138		1	1		2			2		6
172	Lower Providence Township, Montgomery Co.		Phila. Jewish Sanatorium, Eagleville,									
173	Lower Towamensing Township, Carbon Co.		New Jersey Zinc Co. (Territory inc. in Palmerton Oct. 14, 1912.)									
	Lower Towamensing Township, Carbon Co.		Palmer Land Co. (Territory inc. in Palmerton Oct. 14, 1912.)									
174	Lykens, Dauphin Co.,	139								1		1
175	McAdoo, Schuylkill Co.,	140					2					2
	Selinsgrove, Snyder Co.,		45 McClure, H. M.,	2								2
176	McKeesport, Allegheny Co.,	141				3			1			4
177	Mahoning Township, Montour Co.,		State Hosp. for Ins., Danville.									
178	Manorville, Armstrong Co.,	142					1					1
179	Mansfield, Tioga Co.,	143						1				1
180	Marianna, Washington Co.,		Pittsburgh-Buffalo Co.,									

181	Marcus Hook, Delaware Co.,	144			1		1	1				3
	Uniontown, Fayette Co.,		46 Markle & Frank,				1					1
182	Mars, Butler Co.,	145					1	2				3
183	Masontown, Fayette Co.,	146						1	1			2
	Carbondale Township, Lackawanna Co.,		47 Mayfield Yards (Citizens),					1				1
184	Meadville, Crawford Co.,	147		1					1	1		3
185	Mercer, Mercer Co.,	148				1						1
186	Meyersdale, Somerset Co.,	149							1		1	2
	Lehigh Township, Carbon Co.,		48 Middle Coal Field Poor Dist.,								1	1
187	Middletown, Dauphin Co.,		49 Middletown Drainage Co.,			1			1	1		3
188	Middletown Township, Bucks Co.,		Rumpf's Sons, Fred.,									
189	Middletown Township, Delaware Co.,		Delaware County House of Employment,									
	Middletown Township, Delaware Co.,		Glen Mills Schools, Girls' Department,									
	Middletown Township, Delaware Co.,		Penna. Training Sch. for F. M. C., Elwyn,									
	Middletown Township, Delaware Co.,		Williamson Free Sch. of Mech. Trades,									
190	Millbourne, Delaware Co.,	150								1	1	2
191	Mill Creek Township, Erie Co.,		Erie Improvement Co., Erie,									
192	Mill Hall, Clinton Co.,	151								1		1
193	Millvale, Allegheny Co.,	152						1		1		2
194	Millville, Columbia Co.,	153					1					1
195	Milton, Northumberland Co.,	154		1			1					2
196	Miners Mills, Luzerne Co.,	155					1					1
197	Minersville, Schuylkill Co.,	156				1						1
198	Monaca, Beaver Co.,	157				1						1
199	Monessen, Westmoreland Co.,	158					1	1	1			3
200	Montgomery, Lycoming Co.,	159				1						1

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

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201	Moreland Township, Montgomery Co., ...		Bryn Athyn Village Association, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Moreland Township, Montgomery Co., ...		Phila. Rapid Transit Co., Willow Grove Park.	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Morganza, Washington Co., ...		Penna. Training School (Cecil Twp.), ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
202	Mt. Carmel, Northumberland Co., ...	160	.....	1	.....	1	.....	.....	.....	.....	.....	2
	South Londonderry Township, Lebanon Co.		50 Mt. Gretna Park, ...	.....	.....	.....	.....	2	.....	.....	.....	2
203	Mt. Lebanon Township, Allegheny Co., ..	161	.....	.....	.....	.....	.....	.....	.....	1	3	4
204	Mt. Oliver, Allegheny Co., ...	162	.....	.....	.....	.....	1	.....	.....	.....	.....	1
205	Mt. Pleasant, Westmoreland Co., ...	163	.....	.....	.....	.....	2	1	.....	.....	.....	3
206	Mt. Union, Huntingdon Co., ...	164	.....	.....	.....	1	.....	.....	1	1	.....	3
207	Nanticoke, Luzerne Co., ...	165	.....	.....	.....	.....	1	.....	.....	.....	.....	1
208	Narberth, Montgomery Co., ...	166	.....	.....	1	.....	.....	.....	.....	.....	.....	1
209	Nazareth, Northampton Co., ...	167	.....	.....	.....	.....	.....	.....	1	1	.....	2
	Nazareth, Northampton Co., ...		51 Nazareth Sewerage Co. (Agent of Borough).	.....	.....	.....	.....	.....	.....	.....	1	1
210	New Brighton, Beaver Co., ...	168	.....	.....	.....	.....	.....	.....	1	2	.....	3
211	New Castle, Lawrence Co., ...	169	.....	2	2	1	.....	1	1	.....	.....	7

212	New Cumberland, Cumberland Co.,	170							1			1
	New Cumberland, Cumberland Co. (vicinity).		Elkwood Sewerage Co. (Lower Allen Twp.)									
	Palmerton (Inc. Oct. 14, 1912, from L. Towamensing Township).		52 New Jersey Zinc Co.,		1							1
213	New Kensington, Westmoreland Co.,	171				1	1			1	1	4
214	New Oxford, Adams Co.,		53 New Oxford Drainage Co.,		1							1
215	Newport, Perry Co.,	172			2							2
216	Newton Township, Lackawanna Co.,		Scranton Poor Dist. Hillside Home,									
217	New Wilmington, Lawrence Co.,	173				2	1					3
218	Norristown,	174									1	1
	Norristown,		State Hosp. for Ins. of the S. E. Dist.,									
219	North Braddock, Allegheny Co.,	175					1	2		1	1	5
220	North Charleroi, Washington Co.,	176						1			1	2
221	North East, Erie Co.,	177				1				1	1	3
222	North Manheim Township, Schuylkill Co.,		Schuylkill Co. Poor Farm and Hosp. for Insane.									
223	Northumberland, Northumberland Co.,	178		1			1			1		3
	Edinboro, Erie Co.,		Northwestern State Normal School,									
224	Norwich Township, McKean Co.,		Goodyear Lumber Co. (Now Norwich Lumber Co.)									
225	Norwood, Delaware Co.,	179							1		1	2
226	Oakmont, Allegheny Co.,	180			1							1
227	O'Hara Township, Allegheny Co.,		Allegheny City Home,									
	O'Hara Township, Allegheny Co.,		Allegheny Co. Workhouse,									
	O'Hara Township, Allegheny Co.,		Aspinwall-Delafield Co.,									
	O'Hara Township, Allegheny Co.,		Blaw Steel Centering Co.,									
	O'Hara Township, Allegheny Co.,		Pittsburgh Filter Plant,									
228	Oil City, Venango Co.,	181		1			2					3
229	Old Forge, Lackawanna Co.,	182							2			2

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

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230	Olyphant, Lackawanna Co.,	183		.....	.....	1	2	1	.....	1	.....	5
231	Osborne, Allegheny Co.,	184		1	2	.....	1	1	.....	1	.....	6
232	Palmerton (Inc. Oct. 14, 1912, from L. Towamensing Township).		New Jersey Zinc Co.,	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Palmerton (Inc. Oct. 14, 1912, from L. Towamensing Township).		54 Palmer Land Co. (Sewerage Taken over by Palmerton Disposal Co. Oct. 1st, 1912.)	.....	.....	1	.....	.....	1	.....	.....	2
233	Parker, Armstrong Co.,	185		.....	.....	.....	.....	.....	1	.....	.....	1
234	Parkesburg, Chester Co.,	186		.....	.....	.....	.....	.....	.....	.....	1	1
235	Parnassus, Westmoreland Co.,	187		.....	.....	1	.....	.....	.....	.....	.....	1
236	Parsons, Luzerne Co.,	188		.....	.....	.....	.....	1	1	.....	1	3
237	Patterson Heights, Beaver Co.,	189		.....	.....	.....	1	.....	.....	1	.....	2
	Springdale, Allegheny Co.,		55 Penna. Glue Co.,	1	.....	.....	.....	.....	.....	.....	.....	1
	Smithfield Township, Huntingdon Co.,		56 Penna. Ind. Ref., Huntingdon,	.....	.....	.....	1	.....	.....	.....	.....	1
	State College, Centre Co.,		57 Penna. State College,	.....	.....	.....	.....	1	.....	1	.....	2
	Susquehanna Township, Dauphin Co.,		58 Penna. State Luna. Hosp., Harrisburg,	.....	.....	.....	1	.....	.....	.....	.....	1
	Cecil Township, Washington Co.,		59 Penna. Training Sch., Morganza,	.....	.....	1	.....	1	.....	.....	.....	2
	Middletown Township, Delaware Co.,		60 Penna. Training Sch. for F. M. C., Elwyn,	.....	.....	1	.....	1	.....	.....	.....	2
238	Perkasie, Bucks Co.,		Cressman, Philip,	.....	.....	.....	.....	.....	.....	.....	.....	.....

239	Petersburg, Huntingdon Co.,	190					1					1
240	Philadelphia, *One permit concerns night soil disposal.	191		8	8	14	15	12	9	15*		81
	Philadelphia,		61 Phila. Inst. for F. M. & Byberry Farms Tub. Sana. (1st decree for latter only.)						2			2
	L. Providence Township, Montgomery Co.		62 Phila. Jewish Sana., Eagleville,			1						1
	Moreland township, Montgomery Co.,		63 Phila. Rapid Trans. Co., Willow Grove Park.							1		1
241	Pine Creek Township, Jefferson Co.,		Jefferson Co. Commissioners,									
242	Pitcairn, Allegheny Co.,	192		1		1	1					3
243	Pittsburgh, Allegheny Co.,	193					4					4
	O'Hara Township, Allegheny Co.,		64 Pittsburgh Filter Plant,	1								1
	Marianna, Washington Co.,		65 Pittsburgh-Buffalo Co.,				1			1		2
244	Pleasantville, Venango Co.,	194					1		2			3
245	Plymouth, Luzerne Co.,	195						1				1
246	Polk, Venango Co.,		State Inst. for Feeble-Minded,									
247	Portage, Cambria Co.,	196						1	1			2
248	Port Allegany, McKean Co.,	197							1			1
249	Port Royal, Juniata Co.,	198							1			1
250	Pottstown, Montgomery Co.,	199							1			1
251	Pottsville, Schuylkill Co.,	200		1*	1	1						3
	Yorkville (permit *1907). (Annexed later in 1907 to Pottsville q. v.)											
252	Prospect Park, Delaware Co.,	201								1		1
253	Punxsutawney, Jefferson Co.,	202				1	1					2
254	Quakertown, Bucks Co.,	203						1				1
255	Radnor Township, Delaware Co.,		Wayne Sew. Co.,									
	Radnor Township, Delaware Co.,		Home & Hosp. of the Good Shep.,									
256	Rankin, Allegheny Co.,	204							1			1

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257	Reading, Berks Co.,	205				3						3
258	Renovo, Clinton Co.,	206					1		1		1	3
	Renovo, Clinton Co. (vicinity),		Drocton Land Co. (Chapman Twp.),									
259	Reynoldsville, Jefferson Co.,	207				1						1
260	Ridgway, Clearfield Co.,	208				1				1		2
261	Ridley Park, Delaware Co.,	209				1				1	1	3
	Rittersville, Lehigh Co.,		Homoeo. State Hosp. for Ins., Hanover Twp.									
262	Rochester, Beaver Co.,	210						1				1
	Middletown Township, Bucks Co.,		66 Rumpf's Sons, Fred.,						1			1
	Willistown Township, Chester Co.,		67 Rush Hospital, Country Branch,						1			1
263	St. Clair, Allgeheny Co.,	211					1					1
264	St. Clair, Schuylkill Co.,	212				1						1
	Bensalem Township, Bucks Co.,		68 St. Francis Ind. School, Eddington P. O.,							1		1
265	St. Marys, Elk Co.,	213			1							1
266	Saltsburg, Indiana Co.,	214			1							1
267	Sayre, Bradford Co.,	215		1			1					2

268	Scalp Level, Cambria Co.,	216			1	2							3
	North Manheim Township, Schuylkill Co.		69 Schuylkill County Poor Farm and Hosp. for Insane.						1				1
269	Schuylkill Haven, Schuylkill Co.,	217						1					1
270	Scottdale, Westmoreland Co.,	218				1	1						2
271	Scott Township, Allegheny Co.,	219						1					1
	Scott Township, Allegheny Co.,		Delmont Land Co. (Annexed in 1939 to Dormont q. v.)										
	Scott Township, Allegheny Co.,		Dysart, A. P.,										
272	Selinsgrove, Snyder Co.,		McClure, H. M.,										
273	Sewickley, Allegheny Co.,	220				1	1						2
	Newton Township, Lackawanna Co.,		70 Scranton Poor Dist., Hillside Home,									1	1
	Abington Township, Montgomery Co.,		71 Seybert Institution,									1	1
274	Shaler Township, Allegheny Co.,	221			1								1
275	Sharon, Mercer Co.,	222				1				1	1		3
276	Sharon Hill, Delaware Co.,	223		1		1						1	3
277	Sharpsville, Mercer Co.,	224				1		1					2
278	Shenandoah, Schuylkill Co.,	225				1						1	2
279	Shingle House, Potter Co.,	226						1					1
280	Siverly, Venango Co.,	227					1						1
281	Slippery Rock, Butler Co.,	228					1						1
282	Smethport, McKean Co.,	229					1						1
283	Smithfield Township, Huntingdon Co.,		Penna. Ind. Ref., Huntingdon,										
284	Somerset, Somerset Co.,	230						1		1			2
285	Somerset Township, Somerset Co.,		72 Somerset County Home,							2			2
286	South Bethlehem, Armstrong Co.,	231					1						1
287	South Bethlehem, Northampton Co.,	232		1				2	1	2			6
288	South Brownsville, Fayette Co.,	233						1	1			1	3

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

Numbering of municipalities.	PLACES SERVED. Municipalities numbered alphabetically; also again entered opposite alphabetical entries of Non-municipal Recipients.	RECIPIENTS OF PERMITS AND DECREES. Numbering of municipal owners.	Private Corporations, Individuals and Institutions. Numbered alphabetically; also again entered opposite alphabetical entries of Places Served.	Permits and Decrees by Years opposite numbered entries of Recipients. 1905 & 1906	1907	1908	1909	1910	1911	1912	1913	Total
289	South Canonsburg (now part of Canonsburg), Washington Co.	234	.....	.....	.....	2	.....	.....	.....	.....	.....	2
290	South Fork, Cambria Co., ...	235	.....	.....	.....	.....	.....	3	.....	1	.....	4
291	S. Londonderry Township, Lebanon Co.,		Mt. Gretna Park, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
292	South Renovo, Clinton Co., ...	236	.....	.....	.....	.....	.....	.....	.....	.....	1	1
	South Sharon (became Farrell in 1912), ...		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
293	South Whitehall Township, Lehigh Co.,		Lehigh County Commissioners, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Spring City, Chester Co. (vicinity), ...		East. Penna. State Inst. for F. M. & E. (E. Vincent Twp.)	.....	.....	.....	.....	.....	.....	.....	.....	.....
294	Springdale, Allegheny Co. (Inc. Oct. 17, '06, from part of Springdale Twp.),	237	.....	.....	.....	.....	.....	.....	1	1	1	3
	Springdale, Allegheny Co. (Inc. Oct. 17, '06, from part of Springdale Twp.),		Penna. Glue Co., ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
295	Springfield Township, Delaware Co., ...		Dermady Sana., near Morton, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
296	State College, Centre Co., ...	238	.....	.....	.....	.....	.....	.....	.....	.....	1	1
	State College, Centre Co., ...		John Hamilton. (Permit for part of College Twp., later annexed to borough.)	.....	.....	.....	.....	.....	.....	.....	.....	.....
	State College, Centre Co., ...		Penna. State College, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
			(State Institutions. Permits credited in alphabetical entries.)	.....	.....	.....	.....	.....	.....	.....	.....	.....

	West Pikeland Township, Chester Co.,		Chester Springs Soldiers' Orphans' School.	.....	.....	.....	.....	.....	.....	.....	.....
	East Vincent Township, Chester Co., ..		E. Penna. State Inst. for F. M. & E., near Spring City.	.....	.....	.....	.....	.....	.....	.....	.....
	Hanover Township, Lehigh Co., ...		Homoco. State Hosp. for the Insane, Rittersville.	.....	.....	.....	.....	.....	.....	.....	.....
	Smithfield Township, Huntingdon Co.,		Penna. Industrial Ref., Huntingdon, ...	.....	.....	.....	.....	.....	.....	.....	.....
	Cecil Township, Washington Co., ...		Penna. Training School, Morganza, ...	.....	.....	.....	.....	.....	.....	.....	.....
	State College, Centre Co., ...		Penna. State College, ...	.....	.....	.....	.....	.....	.....	.....	.....
	Susquehanna Township, Dauphin Co., ..		Penna. State Luna. Hosp., at Harrisburg,	.....	.....	.....	.....	.....	.....	.....	.....
	Lower Heidelberg Township, Berks Co.,	73	State Asylum for Chron. Ins. of Penna., Wernersville.	.....	.....	.....	1	.....	.....	.....	1
	Canaan Township, Wayne Co., ...	74	State Hosp. for Crim. Ins., Farview Sta., ..	.....	.....	.....	.....	.....	.....	1	1
	Mahoning Township, Montour Co., ...	75	State Hosp. for the Ins., Danville, ...	.....	.....	.....	1	.....	.....	.....	1
	Conewango Township, Warren Co., ...	76	State Hosp. for the Ins., Warren, ...	.....	1	.....	.....	.....	.....	1	2
	Norristown, Montgomery Co., ...	77	State Hosp. for the Ins. of the S. E. Dist.,	.....	.....	.....	1	1	.....	.....	2
	Polk, Venango Co., ...	78	State Inst. for Feeble-Minded of W. Penna.,	.....	1	.....	.....	1	.....	.....	2
	Hempfield Township, Westmoreland Co.,	79	State Police Barracks, near Greensburg, ..	.....	.....	.....	.....	.....	.....	1	1
297	Stoyestown, Somerset Co., ...	239	.....	1	.....	.....	.....	.....	.....	.....	1
298	Stroudsburg, Monroe Co., ...	240	.....	.....	.....	1	.....	.....	.....	.....	1
	Susquehanna Township, Dauphin Co., ...	80	Suburban Drainage Co., Harrisburg, ...	.....	.....	.....	1	.....	1	1	3
299	Summerhill, Cambria Co., ...	241	.....	.....	.....	.....	.....	.....	1	1	2
300	Summit Hill, Carbon Co., ...	242	.....	.....	1	1	.....	1	.....	.....	3
301	Sunbury, Northumberland Co., ...		East End Sewer Company, ...	.....	.....	.....	.....	.....	.....	.....	.....
	Sunbury, Northumberland Co., ...		Susquehanna Sewer Company, ...	.....	.....	.....	.....	.....	.....	.....	.....
	Sunbury, Northumberland Co., ...		Third Ward Sewer Company, ...	.....	.....	.....	.....	.....	.....	.....	.....
302	Susquehanna Depot, Susquehanna Co., ..	243	.....	1	.....	.....	1	1	.....	.....	3
	Sunbury, Northumberland Co., ...	81	Susquehanna Sewer Co., ...	1	.....	.....	.....	.....	.....	.....	1
303	Susquehanna Township, Dauphin Co., ...		Penna. State Luna. Hosp., Harrisburg, ..	.....	.....	.....	.....	.....	.....	.....	.....
	Susquehanna Township, Dauphin Co., ...		Suburban Drainage Company, ...	.....	.....	.....	.....	.....	.....	.....	.....

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913--Continued.

Numbering of municipalities.	PLACES SERVED. Municipalities numbered alphabetically; also again entered opposite alphabetical entries of Non-municipal Recipients.	RECIPIENTS OF PERMITS AND DECREES. Numbering of municipal owners.	Private Corporations, Individuals and Institutions. Numbered alphabetically; also again entered opposite alphabetical entries of Places Served.	Permits and Decrees by Years opposite numbered entries of Recipients. 1905 to 1906	1907	1908	1909	1910	1911	1912	1913	Total
304	Swarthmore, Delaware Co.,	244				1	1				1	3
305	Tarentum, Allegheny Co.,	245				1	2				1	4
306	Taylor, Lackawanna Co.,	246			1		1					2
307	Taylor Township, Lawrence Co.,		West Pittsburgh Realty Co.,									
	Sunbury, Northumberland Co.,		82 Third Ward Sewer,	1								1
308	Thornbury Township, Delaware Co.,		Glen Mills Schools, Boys' Department,									
309	Throop, Lackawanna Co.,	247							1			1
310	Titusville, Crawford Co.,	248		1	1							2
311	Towanda, Bradford Co.,	249						1			1	2
	Zerbe Township, Northumberland Co.,		83 Trevorton Sewerage Co.,			1						1
312	Tyrone, Blair Co.,	250						1				1
	Ulysses P. O., see Lewisville,											
313	Union City (borough), Erie Co.,	251				1					1	2
314	Unionitown, Fayette Co.,	252					2	1		1	1	5
	Uniontown, Fayette Co.,		Markel & Frank,									
315	Upland, Delaware Co.,	253				1		1				2
316	Upper Darby Township, Delaware Co.,	254								2	1	3

	Lower Burrell Township, Westmoreland Co.		84 Valley Camp Ass'n,	.....	.....	.....	.....	.....	1	.....	.....	1
317	Verona, Allegheny Co.,	255		.....	1	1	.....	.....	1	.....	.....	3
318	Versailles, Allegheny Co.,	256		.....	1	.....	.....	.....	.....	.....	.....	1
	East Bethlehem Township, Washington Co.		85 Vesta Coal Co.,	.....	.....	.....	.....	1	.....	.....	1	2
319	Wall, Allegheny Co.,	257		.....	1	.....	.....	.....	.....	.....	.....	1
320	Warren, Warren Co.,	258		1	1	.....	1	1	.....	1	.....	5
	Warren, Warren Co. (vicinity),		State Hosp. for the Ins. (Conewango Twp.)	.....	.....	.....	.....	.....	.....	.....	.....	.....
321	Warrior Run, Luzerne Co.,	259		.....	.....	.....	.....	.....	1	1	.....	2
322	Washington, Washington Co.,	260		.....	1	.....	1	1	1	1	2	7
	Washington and East Washington,			.....	.....	.....	.....	.....	1	.....	.....	1
323	Watsontown, Northumberland Co.,	261		.....	.....	1	.....	.....	.....	.....	.....	1
	Radnor Township, Delaware Co.,		86 Wayne Sewerage Co.,	1	.....	.....	.....	.....	.....	1	.....	2
324	Weatherly, Carbon Co.,	262		.....	.....	.....	.....	.....	.....	1	.....	1
325	Wellsboro, Tioga Co.,	263		1	.....	1	.....	.....	.....	.....	.....	2
	Wernersville P. O., Berks Co.,		State Asylum for Chron. Ins. (L. Heidelberg Twp.)	.....	.....	.....	.....	.....	.....	.....	.....	.....
326	West Bradford Township, Chester Co., ..		Chester Co. Home & Hosp. for Ins.,	.....	.....	.....	.....	.....	.....	.....	.....	.....
327	West Brownsville, Washington Co.,	264		.....	.....	.....	1	.....	1	1	.....	3
328	West Chester, Chester Co.,	265		1	.....	.....	.....	1	1	.....	.....	3
329	West End, Venango Co.,	266		.....	.....	.....	1	.....	.....	.....	.....	1
330	West Hazleton, Luzerne Co.,	267		.....	.....	.....	1	.....	.....	1	.....	2
	Baldwin Township, Allegheny Co.,		87 West Liberty Improvement Co.,	.....	.....	.....	.....	1	.....	.....	.....	1
331	West Middlesex, Mercer Co.,	268		1	.....	.....	.....	.....	.....	.....	.....	1
332	West Newton, Westmoreland Co.,	269		.....	.....	.....	1	1	.....	1	1	4
	Kilbuck Township, Allegheny Co.,		88 West. Penna. Hosp. for the Ins., Dixmont,	.....	.....	.....	1	.....	.....	.....	.....	1
333	West Pikeland Township, Chester Co., ...		Chester Springs Soldiers' Orphans' School,	.....	.....	.....	.....	.....	.....	.....	.....	.....

SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL AND PLACES SERVED, 1905-1913—Continued.

Numbering of municipalities.	PLACES SERVED. Municipalities numbered alphabetically; also again entered opposite alphabetical entries of Non-municipal Recipients.	RECIPIENTS OF PERMITS AND DECREES. Numbering of municipal owners.	Private Corporations, Individuals and Institutions. Numbered alphabetically; also again entered opposite alphabetical entries of Places Served.	Permits and Decrees by Years opposite numbered entries of Recipients. 1905 & 1906	1907	1908	1909	1910	1911	1912	1913	Total
	Taylor Township, Lawrence Co., ...		89 West Pittsburgh Realty Co., ...	.....	.....	.....	1	1	.....	1	.....	3
334	West Reynoldsville, Jefferson Co., ...	270	.....	.....	.....	1	.....	.....	.....	.....	.....	1
335	West View, Allegheny Co., ...	271	.....	.....	.....	.....	1	.....	1	.....	.....	2
336	White Haven, Luzerne Co., ...	272	.....	.....	.....	1	.....	.....	.....	.....	.....	1
	College Hill, Beaver Co., ...		90 Whiteside, Robt. A., ...	.....	.....	.....	1	.....	.....	.....	.....	1
337	Wickboro, Armstrong Co., ...	273	.....	.....	.....	1	.....	.....	.....	.....	.....	1
338	Wilkes-Barre, Luzerne Co., ...	274	.....	.....	.....	.....	.....	.....	.....	1	.....	1
339	Wilkinsburg, Allegheny Co., ...	275	.....	.....	.....	.....	.....	1	.....	.....	.....	1
340	Wilkins Township, Allegheny Co., ...		East Wilkinsburg Improvement Co., ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Middletown Township, Delaware Co., ..		91 Williamson Free Sch. of Mech. Trades, ...	.....	.....	1	.....	.....	.....	.....	.....	1
341	Williamsport, Lycoming Co., ...	276	.....	.....	2	.....	.....	.....	.....	.....	.....	2
342	Willistown Township, Chester Co., ...		Rush Hospital, Country Branch, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Willow Grove Park, Moreland Township, Montgomery Co.		Phila. Rapid Transit Co., ...	.....	.....	.....	.....	.....	.....	.....	.....	.....
343	Winton, Lackawanna Co., ...	277	.....	.....	.....	1	.....	.....	.....	.....	.....	1
344	Woodlawn (Inc. 1909), Beaver Co., ...		Jones & Laughlin Steel Co. Sewers taken over.	.....	.....	.....	.....	.....	.....	.....	.....	.....

345	Wyoming, Luzerne Co.,	278			1			1		1	1	4
346	Yeadon, Delaware Co.,	279				1		1			1	3
347	York, York Co.,	280		1	1						1	3
348	Yorkville, Schuylkill Co. (permit in 1907). Annexed later in 1907 to Pottsville q. v.	281			•							•
349	Youngsville, Warren Co.,	282		1								1
350	Youngwood, Westmoreland Co.,	283				1						1
351	Zelienople, Butler Co.,	284		1		1			1			3
352	Zerbe Township, Northumberland Co.,		Trevorton Sewerage Co.,									
			Summary of Permits,	51	86	129	114	111	80	119	109	799

CLASSIFICATION OF SEWERAGE PERMITS AND DECREES ISSUED BY THE COMMISSIONER OF HEALTH WITH THE AGREEMENT OF THE GOVERNOR AND ATTORNEY GENERAL, 1905-1913.

Before the State undertook the regulation of the sewage pollution of its waters through the legislation requiring the public authorities having by law the charge of the sewer system of any municipality to submit their sewerage plans for the approval of the Governor, the Attorney General and the Commissioner of Health, haphazard methods of building sewers regardless of system were quite generally in vogue throughout the Commonwealth. Now this has been changed. Some idea of the value of the engineering work of the State Department of Health may be obtained from considering the number of comprehensive plans for public sewerage systems which have been prepared and submitted to the Department for approval up to the present time as a result of its formal requirements and educational program. There are 190 such comprehensive plans that have been approved, either in detail or tentatively, in permits and decrees issued by agreement of the Governor, Attorney General and Commissioner of Health, and the necessary extensions of these systems from year to year are being made in conformity with these plans. The State could not be a party to a plan for desultory additions to existing sewers, regardless of system. In the following table are given the 190 recipients of permits and decrees approving comprehensive sewerage plans.

1. Aldan.
2. Aliquippa.
3. Allentown.
4. Altoona.
5. Arnold.
6. Aspinwall-Delafield Co.
7. Avoca.
8. Baden.
9. Beaver.
10. Bedford.
11. Bellevue.
12. Ben Avon.
13. Blairsville.
14. Blakely.
15. Brackenridge.
16. Bradford.
17. Bristol.
18. Butler-Highfields Land and Improvement Co.
19. Cambridge Springs.
20. Canonsburg.
21. Carbondale.
22. Carlisle.
23. Carmichaels.
24. Carrick.
25. Chambersburg.
26. Charleroi.
27. Chester.
28. Cheswick.
29. Coaldale.
30. College Hill.
31. Collier Land Co.
32. Collingdale.
33. Columbia.
34. Colwyn.
35. Corry.
36. Coudersport.
37. Cressman, Philip, (Perkasie).
38. Cresson.
39. Danville.
40. Darby.
41. Derry
42. Dickson City.
43. Donora.
44. Dormont.
45. Dorranceton.
46. Doylestown Sewerage Co.
47. Drocton Land Co.
48. Duquesne.
49. Dunmore.
50. Duryea.
51. Dysart, A. P., (Scott Twp.)
52. Eagles Mere.
53. East Brady.

54. East Lansdowne.
55. East McKeesport.
56. East Mauch Chunk.
57. Easton.
58. East Wilkinsburg Improvement Co.
59. Eddystone.
60. Edinboro.
61. Edwardsville.
62. Ellwood City.
63. Emlenton.
64. Emsworth.
65. Erie.
66. Erie Improvement Co.
67. Etna.
68. Evansburg.
69. Everson.
70. Fair Oaks Land Co.
71. Farrell.
72. Forest City.
73. Forty Fort.
74. Glenolden.
75. Goodyear Lumber Co. (now Norwich Lumber Co).
76. Green Tree.
77. Greenville.
78. Grove City.
79. Hamilton, John, (State College).
80. Harrisburg.
81. Hastings.
82. Houtzdale.
83. Indiana.
84. Jeannette.
85. Jenkintown.
86. Jersey Shore.
87. Johnsonburg.
88. Jones and Laughlin Steel Co.
89. Kane.
90. Kingston.
91. Koppel Land Co.
92. Lancaster.
93. Lansdale.
94. Lansdowne.
95. Lebanon.
96. Lehighton.
97. Lewisburg.
98. Lewistown.
99. Lewisville.
100. Ligonier.
101. Lower Merion Township, Montgomery County.
102. Lykens.
103. McAdoo.
104. Marcus Hook.
105. Mars.
106. Masontown.
107. Mayfield Yards.
108. Mercer.
109. Meyersdale.
110. Middletown Drainage Co.
111. Millbourne.
112. Millvale.
113. Milton.
114. Miners Mills.
115. Monessen.
116. Mt. Carmel.
117. Mt. Gretna Park.
118. Mt. Lebanon Township, Allegheny County.
119. Mt. Oliver.
120. Mt. Pleasant.
121. Mt. Union.
122. Narberth.
123. Nazareth.
124. New Brighton.
125. New Castle.
126. New Kensington.
127. Newport.
128. New Wilmington.
129. North Charleroi.
130. North East.
131. Northumberland.
132. Olyphant.
133. Osborne.
134. Palmer Land Co. (sewerage taken over by Palmerton Disposal Co.)
135. Parsons.
136. Patterson Heights.
137. Pleasantville.
138. Portage.
139. Pottstown.
140. Quakertown.
141. Reading.
142. Renovo.
143. Ridgway.
144. Ridley Park.
145. St. Clair, Allegheny County.
146. St. Marys.
147. Sayre.
148. Scott Township, Allegheny County.
149. Sewickley.
150. Shaler Township.
151. Sharon.
152. Sharon Hill.
153. Sharpsville.
154. Siverly.
155. Somerset.
156. South Canonsburg.
157. South Fork.
158. South Renovo.
159. Springdale.
160. State College.
161. Suburban Drainage Co.
162. Summerhill.
163. Summit Hill.
164. Susquehanna Depot.
165. Swarthmore.
166. Tarentum.
167. Throop.
168. Towanda.
169. Union City.
170. Uniontown.
171. Upland.
172. Upper Darby Township, Delaware County.
173. Vesta Coal Co.
174. Wall.
175. Warren.
176. Washington.
177. Watsontown.
178. Wayne Sewerage Co.
179. West Chester.
180. West End.
181. West Hazleton
182. West Liberty Improvement Co.
183. West Newton.
184. West Pittsburgh Realty Co.
185. West View.
186. Wilkinsburg.
187. Winton.
188. Wyoming.
189. Yeadon.
190. York.

For seventy places sewage treatment works have been built or are in progress of erection in accordance with plans passed upon in permits and decrees issued by the State Department of Health. The recipients of such permits and decrees are as follows:

1. Allegheny City Home, O'Hara Township.
2. Allegheny County Home and Hospital for Insane, Collier Township.
3. Allegheny County Work House, O'Hara Township.
4. Bethany Orphans' Home, Heidelberg Township, Berks County.
5. Blaw Steel Centering Company, O'Hara Township, Allegheny County.
6. Bristol.
7. Brittain, A. R., et al., East Stroudsburg.
8. Bryn Athyn Village Association, Moreland Township, Montgomery County.
9. Buck Hill Falls Company, Barrett Township, Monroe County.
10. Carlisle.
11. Chambersburg.
12. Chester County Home & Hospital for the Insane, West Bradford Township.
13. Chester Springs Soldiers' Orphans' School, West Pikeland Township, Chester County.
14. Cressman, Philip, (public sewerage of Perkasie).
15. Delaware County House of Employment, Middletown Township.
16. Dermady Sanatorium, Springfield Township, Delaware County.
17. Derry.
18. Dormont.
19. Doylestown Sewerage Company.
20. Eastern Pennsylvania State Institution for the Feeble Minded and Epileptic, East Vincent Township, Chester County.
21. *East Washington.
22. Glen Mills Schools, Boys' Department, Thornbury Township, Delaware County.
23. Glen Mills Schools, Girls' Department, Middletown Township, Delaware County.
24. Goodyear Lumber Company (now Norwich Lumber Company), Norwich Township, McKean County.
25. Haverford College, Haverford Township, Delaware County.
26. Home and Hospital of the Good Shepherd, Radnor Township, Delaware County.
27. Homœopathic State Hospital for the Insane, Hanover Township, Lehigh County.
28. Howard J. W. & A. P., & Co., Ltd., Tannery, Columbus Township, Warren County, (near Corry).
29. Indiana.
30. Lebanon.
31. Lehigh County Home and Almshouse, South Whitehall Township.
32. Ligonier.
33. Middle Coal Field Poor District, Lehigh Township, Carbon County.
34. Mt. Gretna Park, South Londonderry Township, Lebanon County.
35. Mt. Lebanon Township, Allegheny County.
36. Nazareth Sewerage Company (temporary works).
37. New Jersey Zinc Company, Palmerton.
38. New Wilmington.
39. Palmer Land Company, Palmerton. (Sewerage taken over by Palmerton Disposal Company, October 1, 1912.)
40. Pennsylvania Glue Company, Springdale.
41. Pennsylvania Industrial Reformatory, Smithfield Township, Huntingdon County.
42. Pennsylvania State College, State College.
43. Pennsylvania State Lunatic Hospital, Susquehanna Township, Dauphin County.
44. Pennsylvania Training School, Cecil Township, Washington County.
45. Philadelphia (Pennypack Creek District).
46. Philadelphia Jewish Sanatorium for Consumptives, Lower Providence Township, Montgomery County.
47. Philadelphia Rapid Transit Company, Willow Grove Park, Moreland Township, Montgomery County.
48. Pittsburgh Filter Plant, near Aspinwall, O'Hara Township, Allegheny County.
49. Pleasantville.
50. Reading.
51. Rumpf's Sons, Frederick, Middletown Township, Bucks County.
52. Rush Hospital, Country Branch, Willistown Township, Chester County.
53. St. Francis Industrial School, Bensalem Township, Bucks County.
54. Schuylkill County Poor Farm, North Manheim Township.
55. Scranton Poor District, Hillside Home, Newton Township, Lackawanna County.

56. Seybert Institution, Abington Township, Montgomery County.
57. Somerset County Home, Somerset Township.
58. State Asylum for the Chronic Insane of Pennsylvania, Lower Heidelberg Township, Berks County.
59. †State College Borough.
60. State Hospital for the Insane, Mahoning Township, Montour County.
61. State Hospital for the Insane, Conewango Township, Warren County.
62. State Hospital for the Insane of the Southeastern District, Norristown, Montgomery County.
64. State Police Barracks, Hempfield Township, Westmoreland County.
65. Valley Camp Association, Lower Burrell Township, Westmoreland County.
66. Washington.
67. Wayne Sewerage Company, Radnor Township, Delaware County.
68. West Chester.
69. Western Pennsylvania Hospital for the Insane, Kilbuck Township, Allegheny County.
70. Williamson Free School of Mechanical Trades, Middletown Township, Delaware County.

*Washington plant treats also East Washington sewage.
†Pennsylvania State College plant to treat also State College borough sewage temporarily.

In seventy-seven cases plans for sewage treatment works have been submitted to and approved, either finally or tentatively, by the State Department of Health, but no construction work has been done up to the present time. The recipients of permits and decrees which deal with these plans are as follows:

1. Allentown.
2. Altoona (Eastern District).
3. Beechwood Park Amusement Company (project abandoned), Haverford Township, Delaware County.
4. Brownsville.
5. Butler.
6. *Canonsburg.
7. Carmichaels.
8. Chester.
9. Collier Land Company, Collier Township, Allegheny County.
10. †Colwyn.
11. Corry.
12. Coudersport.
13. Danville.
14. †Darby.
15. Devon (Citizens) Easttown Township, Chester County.
16. Donora.
17. Easton.
18. Edinboro.
19. Ellwood City.
20. Erie.
21. Farrell.
22. Greenville.
23. Grove City.
24. Houtzdale.
25. Jefferson County Commissioners, County Home in Pine Creek Township.
26. Jenkintown.
27. Johnsonburg.
28. Lansdale.
29. †Lansdowne.
30. Lehighton.
31. Lewisville.
32. Marcus Hook (pumping plant).
33. Mars.
34. Masontown.
35. Meadville.
36. Meyersdale.
37. Milton.
38. Monessen.
39. Mt. Carmel.
40. Nazareth (permanent works).
41. New Brighton.
42. New Castle.
43. New Kensington.
44. New Oxford Drainage Company, New Oxford.
45. Newport.
46. Norristown (preliminary treatment).
47. North East.
48. Pennsylvania Training School for Feeble Minded Children, Middletown Township, Delaware County.
49. Philadelphia (night soil disposal plant).
50. Philadelphia Institution for Feeble Minded and Byberry Farms Tuberculosis Sanatorium.
51. Portage.
52. Pottstown.
53. Quakertown.
54. Renovo.
55. Ridley Park.
56. St. Marys.
57. Sewickley.
58. Sharon.
59. Sharpsville.
60. Somerset.
61. South Bethlehem, (Northampton County).
62. South Brownsville (only approval of adoption of site).
63. *South Canonsburg (now part of Canonsburg).
64. South Fork.
65. Springdale.
66. State Hospital for the Criminal Insane, Canaan Township, Wayne County.
67. Susquehanna Depot.
68. Swarthmore.
69. Tarentum.
70. Towanda.

71. Union City.
72. Upper Darby Township, Delaware County, (tentative approval of site).
73. Vesta Coal Company, East Bethlehem Township, Washington County.
74. West Pittsburgh Realty Company, Taylor Township, Lawrence County.
75. West View.
76. †Yeadon.
77. York.

*Joint Scheme. ‡Tentative joint scheme for four places.

The reason that most of the above places have as yet undertaken no construction work is that they have unexpired permits for the temporary discharge of crude sewage into State waters, as listed in later tables. A number of others of the above places are small communities which have as yet no sewers but have prepared sewage disposal plans in advance. A few are delinquent and are illegally discharging sewage, among them the New Oxford Drainage Company, which has constructed crude sewage treatment works not in accordance with modifications recommended by the State Department of Health to be made in the plans originally submitted by the Company for approval. The existing sewage disposal plant at Devon is a crude works which this Department has never approved. At the State Hospital for the Criminal Insane at Farview a crude temporary treatment plant has been installed pending final arrangements for the construction of the complete works, tentatively approved as indicated in the foregoing list.

There are three municipalities of the above list which have held popular elections to authorize the increase of municipal indebtedness to defray the cost of sewerage and sewage treatment works where the proposition was voted down, namely, Allentown, Easton, and Upper Darby Township.

There are ten places which have not accepted the terms of permits issued to them, namely:

Bloomsburg.
Clintonville.
East Brady.
East Mauch Chunk.
Edgeworth.
Jeannette.
Port Allegany.
Rankin.
Wall.
West Middlesex.

There are fifty-seven places for which decrees have been issued requiring the discontinuance of the discharge of sewage into State waters, or withholding permission to increase this discharge. The recipients of these decrees are as follows:

1. Aldan.
2. Ashley.
3. Beaver Falls.
4. Bellefonte.
5. Ben Avon Heights Sewer Company.
6. Big Run.
7. Butler-Highfields Land and Improvement Company.
8. Canton.
9. Claysville.
10. Clifton Heights.
11. Coaldale.
12. College Hill.
13. East End Sewer Company.
14. East Stroudsburg.
15. Elizabethville.
16. Emporium.
17. Evansburg.
18. Gilberton.
19. Green Tree.
20. Hallstead.
21. Hanover Sewer Company.

22. Hanover Township, Luzerne County.
23. Harrison Township, Allegheny County.
24. Hughesville.
25. Josephine Furnace and Coke Company.
26. Knoxville.
27. Koppel Land Company.
28. Lock Haven.
29. McKeesport.
30. Mansfield.
31. Markle and Frank, (Uniontown).
32. Mill Hall.
33. Millville.
34. Parker.
35. Parnassus.
36. Patterson Heights.
37. Petersburg.
38. Port Royal.
39. Pottsville.
40. Rochester.
41. St. Clair, Schuylkill County.
42. Schuylkill Haven.
43. Shaler Township, Allegheny County.
44. Slippery Rock.
45. South Renovo.
46. Trevorton Sewerage Company.
47. Tyrone.
48. Upland.
49. Versailles.
50. Weatherly.
51. West Brownsville.
52. West Newton.
53. West Reynoldsville.
54. White Haven.
55. Whiteside, Robert A., (College Hill).
56. Wilkes-Barre.
57. Zelienople.

For seventeen places, permits have been issued for the discharge of sewage into State waters temporarily, but without a date being set for the expiration of this permission. The sewage may have to be treated at any time. The recipients of these permits are as follows:

1. Aspinwall-Delafield Company.
2. Canonsburg.
3. Dayton.
4. Dunmore.
5. Dysart, A. P., (Scott Township, Allegheny County.
6. East Wilkinsburg Improvement Company.
7. Etna.
8. Fairchance.
9. Lower Merion Township.
10. McClure, H. M., (Selinsgrove).
11. Minersville.
12. Narberth.
13. Nazareth.
14. New Brighton.
15. North Braddock.
16. South Canonsburg.
17. Wellsboro.

The Aspinwall-Delafield Company discharges sewage into the Aspinwall borough sewer system and it is stipulated that whenever sewage treatment is required of the borough the same requirement will be made of the company. Canonsburg and South Canonsburg (now one municipality) have had a joint sewage treatment scheme approved by the Department which is to be installed as soon as practicable. Dayton received a permit for the discharge of kitchen waste from five houses only into a storm sewer, the discharge to be discontinued whenever ordered. Dunmore discharges sewage into the sewers of Scranton and will be required to take up the question of sewage treatment when the latter place is so required. The sewer system installed by A. P. Dysart has been taken over by Scott Township and is subject to the requirements made upon this township. The East Wilkinsburg Improvement Company discharges sewage into the sewers of North Braddock which under the terms of a mutual agreement, is responsible for the treatment of the sewage when this becomes necessary. The sewers of Lower Merion Township and, through them, the sewers of Narberth discharge into the sewerage system of Philadelphia, under a mutual agreement relative to utimate sewage disposal. The permit to Nazareth is for the discharge of

partially purified sewage and requires the complete purification of sewage whenever this becomes necessary. Etna, Fairchance, H. M. McClure (who maintains a sewer system for Selinsgrove), Minersville, New Brighton, and North Braddock will be required to take up the question of sewage treatment when it is practicable for the matter to be taken up in a general way in all places in their respective sections. The sewage from many of these places goes into streams grossly polluted with acid mine drainage, so that there is not need at the present time for more than the preparation of comprehensive plans for the collection of sewage and its conveyance to a suitable site for a future sewage treatment plant. A few of the places have prepared tentative sewage treatment plans as shown elsewhere. Wellsboro is not at present able to assume the financial obligations necessary for sewage treatment works; only a few much needed specific extensions have been approved and a permit for further extensions has been withheld.

In the following table are given the name of recipients and dates of expiration of permits issued for the temporary discharge of untreated sewage into the waters of the State:

Name.	Year of Expiration.			
	1914	1915	1916	1917
1. Athens,	*			
2. Avalon,			*	
3. Bedford,			*	
4. Blairsville,		*		
5. Bradford,		*		
6. Cambridge Springs,	*			
7. Carbondale,		*		
8. Charleroi,	*			
9. Collier Land Company,		*		
10. Collingdale,	*			
11. Colwyn,	*			
12. Corry,		*		
13. Coudersport,	*			
14. Danville,	*			
15. Darby,	*			
16. Donora,	*	*		
17. Dorranceton,	*			
18. Duquesne,				*
19. Duryea,	*			
20. East Lansdowne,	*			
21. East McKeesport,			*	
22. Edinboro,			*	
23. Erie,	*			
24. Erie Improvement Company,		*		
25. Everson,		*		
26. Forty Fort,		*		
27. Glenolden,		*		
28. Greenville,	*			
29. Hamilton, John, (State College),	*			
30. Harrisburg,		*		
31. Homestead,			*	
32. Houtzdale,		*		
33. Johnsonburg,	*			
34. Kane,	*			
35. Lansdowne,	*			
36. Lewisville,	*			
37. Lykens,		*		
38. Meadville,		*		
39. Meyersdale,			*	
40. Middletown Drainage Company,		*		
41. Millbourne,	*			
42. Mt. Lebanon Township,			*	
43. Mt. Union,	*			
44. New Castle,	*			

Name.	Year of Expiration.			
	1914	1915	1916	1917
45. North Charleroi,	•			
46. North East,	•			
47. Northumberland,		•		
48. Norwood,		•		
49. Old Forge,	•			
50. Parkesburg,		•		
51. Parsons,		•		
52. Philadelphia,	•			
53. Pittsburgh-Buffalo Company (Marianna),	•			
54. Portage,		•		
55. Prospect Park,		•		
56. Renovo,		•		
57. Ridley Park,		•		
58. Sharon,	•			
59. Sharon Hill,	•			
60. Shenandoah,	•			
61. Somerset,		•		
62. South Fork,		•		
63. Springdale,	•			
64. Suburban Drainage Company (near Harrisburg),		•		
65. Summerhill,		•		
66. Throop,	•			
67. Towanda,			•	
68. Union City,		•		
69. Uniontown,		•		
70. Upper Darby Township,	•			
71. Warrior Run,	•			
72. West Pittsburgh Realty Company,	•			
73. Wyoming,	•			
74. Yeadon,	•			

In 125 instances permits to discharge sewage into the waters of the State ceased on or before the 31st day of December, 1913. There are various reasons why the sewage from some of these places should be permitted to discharge into the natural water courses for a while longer. A number have applications pending for extensions of time, and several have submitted for approval sewage treatment plans, which have been held tentatively under consideration. In some instances the borrowing capacity of municipalities has not been sufficient to enable them to undertake the installation of sewage treatment works. This condition should prove less of an obstacle as a result of the constitutional amendment approved in 1913, the purport of which is to exclude municipal obligations for certain profit-earning improvements from consideration within the meaning of the constitutional limitation of municipal indebtedness, and, furthermore, to increase this limit from seven per centum to ten per centum of the value of taxable property within the municipality. The names of recipients of these permits are given in the following list:

1. Aliquippa.
2. American Steel & Wire Company.
3. Arnold.
4. Avoca.
5. Baden.
6. Barneshoro.
7. Bath.
8. Beaver.
9. Bellevernon.
10. Bellevue.
11. Ben Avon.
12. Blakely.
13. Brackenridge.
14. Brownsville.
15. Butler.
16. California.
17. Carrick.
18. Chartiers Township.
19. Chester.
20. Cheswick.
21. Clairton.
22. Clearfield.

23. Coaldale.
24. Columbia.
25. Connellsville.
26. Coraopolis.
27. Crafton.
28. Cresson.
29. Dickson City.
30. Drocton Land Company.
31. DuBois.
32. Eagles Mere.
33. Eddystone.
34. Edwardsville.
35. Elkwood Sewerage Company.
36. Emlenton.
37. Emsworth.
38. Exeter.
39. Fair Oaks Land Company.
40. Ford City.
41. Forest City.
42. Franklin.
43. Freeport.
44. Gaysport.
45. Glassport.
46. Grove City.
47. Hastings.
48. Hazleton.
49. Hollidaysburg.
50. Huntingdon.
51. Jersey Shore.
52. Jones & Laughlin Steel Company.
53. Kingston.
54. Kittanning.
55. Lancaster.
56. Lansford.
57. Lewisburg.
58. Lewistown.
59. McAdoo.
60. Manorville.
61. Marcus Hook.
62. Mayfield Yards.
63. Mercer.
64. Millvale.
65. Milton.
66. Miners Mills.
67. Monaca.
68. Monessen.
69. Montgomery.
70. Mt. Carmel.
71. Mt. Oliver.
72. Mt Pleasant.
73. Nanticoke.
74. New Cumberland.
75. New Kensington.
76. Newport.
77. Oakmont.
78. Oil City.
79. Olyphant.
80. Osborne.
81. Pitcairn.
82. Pittsburgh.
83. Plymouth.
84. Punxsutawney.
85. Reynoldsville.
86. Ridgway.
87. St. Clair, Allegheny County.
88. St. Marys.
89. Saltsburg.
90. Sayre.
91. Scalp Level.
92. Scottdale.
93. Scott Township, Allegheny County.
94. Sewickley.
95. Sharpsville.
96. Shingle House.
97. Siverly.
98. Smethport.
99. South Bethlehem, Armstrong County.
100. South Bethlehem, Northampton County.
101. South Brownsville.
102. Stoyestown.
103. Stroudsburg.
104. Summit Hill.
105. Susquehanna Depot.
106. Susquehanna Sewer Company.
107. Swarthmore.
108. Tarentum.
109. Taylor.
110. Third Ward Sewer Company.
111. Titusville.
112. Verona.
113. Warren.
114. Watsontown.
115. West Chester.
116. West End.
117. West Hazleton.
118. West Liberty Improvement Company.
119. West View.
120. Wickboro.
121. Wilkinsburg.
122. Williamsport.
123. Winton.
124. Youngsville.
125. Youngwood.

11. DESIGN AND CONSTRUCTION SECTION.

The Engineering Division during the year has performed certain work at the Pennsylvania State Sanatoria for Tuberculosis, Numbers 1, 2 and 3, located, respectively, near Mont Alto, Franklin County; Cresson, Cambria County; and Hamburg, Berks County; also some special miscellaneous work for other State institutions as detailed in the following report.

The design and construction section, formed within the Engineering Division in 1907, has cared for the design and construction of

such engineering work at the State Sanatoria under the general direction of the Chief Engineer of the Department and the immediate supervision of the principal assistant engineer in charge of such work. This section has also had charge of the special engineering design and construction work which it has been found necessary for the Department to undertake under special conditions and in view of certain specific Acts of Assembly. The draughting work of the Department has also been done under the direct supervision of the principal assistant engineer in charge of this section.

WORK DONE FOR THE PENNSYLVANIA STATE SANITORIUM FOR TUBERCULOSIS, NO. 1, MONT ALTO.

Waterworks System.

The 300,000 gallon steel tank on Rock Mountain Point back of the hospital building, forming a part of the fire protection system of the institution, was started in 1912. The report of this Department for that year gave a full description of the tank together with a statement of the award of the contract to Connery & Company, Ltd., of Philadelphia, and an account of the progress made on the work to the close of the year.

The contractor kept a force of men working on the tank all winter in spite of the severity of the weather and the hardships due to building a tank in a location exposed on all sides to the mountain winds. A letter from the contractor dated October 12, 1912, asking for an extension of time on the contract because of delays due to unfavorable labor conditions and unavoidable delay in securing material occasioned by the unusual rush of work at the steel mills was quoted in the 1912 report. After carefully considering the cause of these delays and in view of the spirit of cooperation manifested by the contractor in working during the winter the Commissioner of Health decided that an extension of time for completing the work would be fair and equitable. The extension of thirty working days requested by the contractor was accordingly granted and in addition he was not penalized for the eighteen working days consumed in excess of the extended time, as the Department had not been put to any expense for supervision or suffered any loss during this period because of the non-completion of the tank. The tank was completed on April 12th, filled with water from the force line, tested and found

to be water-tight. The entire cost of the work was the same as the contract price, namely: $4,355.00, the final estimate on the work being as follows:

DEPARTMENT OF HEALTH.
ENGINEERING DIVISION.

CONTRACT NO. 18. FINAL ESTIMATE FOR WORK COMPLETED ON STEEL TANK AT PENNSYLVANIA STATE SANATORIUM NO. 1, MONT ALTO, FRANKLIN COUNTY, PENNSYLVANIA, UP TO MAY 26, 1913.

ACCOUNT OF CONTRACT WITH CONNERY & COMPANY, LTD. DATED AUGUST 5, 1912.

Steel tank 50 ft. in diameter, 20 ft. high, @ $4,355.00,	$4,355 00
Less 20% reserved,	871 00
	$3,484 00
Less previous payments,	3,135 60
Amount due on this estimate,	$348 40

C. A. Emerson, Jr.,
Assistant Engineer in Charge.

Approved, F. Herbert Snow, Chief Engineer.

This estimate was paid and on receipt of releases of liens from the general contractor covering material purchased and payments to subcontractors a final payment of $871.00 was made which represented the twenty per cent. reserve on the contract.

The extension of the force main from the line leading from the Mont Alto Park pumping station to the institution for the purpose of furnishing water to the tank which was commenced during the fall of 1912 was completed early in the spring. This line is six inches in diameter and 1,300 feet in length. It is composed of cast iron pipe of the bell and spigot pattern with the exception of the last 200 feet which is of flange pipe. The line was laid by day labor, the material being purchased through the regular purchasing division of the Department. A six inch gate valve is placed on the line at a point near its junction with the main force line and the valve is provided with a post indicator. This valve normally remains closed but will be opened in case of fire so as to admit the water from the steel tank into the institution distributing system as originally planned.

The contract for the construction of the pumping station on the West Branch of Little Antietam Creek with a force line up the mountain to the institution, which was completed in 1910, included the construction of a filter plant of the rapid sand gravity type to purify the waters of the creek before they were allowed to enter the distributing system. The filter plant which consisted of two reinforced concrete filter units each having a capacity of 150,000 gallons each twenty-four hours, was fully described in the 1910 report of the Department. It was also pointed out that money was not available for

the construction of the entire contract as advertised. The contract was therefore modified to omit the filter plant although the pipe lines and pumping station were constructed and connections left in the line so that the filters could be built later when money should be available. An appropriation for these filters was requested of the Legislature of 1913 and the work was advertised in the usual manner during May. The bids were opened and publicly read on May 29th. Only two proposals for this work were received as given in the following table:

		Pihl & Miller.		New York Continental Jewell Filt. Co.	
	Quantity.	Unit Price.	Amt.	Unit Price.	Amt.
(1) 6″ c. i. pipe, in trench, 4′ to 5′ deep, lin. ft., ..	600	$0.95	$570.00	$1.10	$660.00
(2) Trench over 5′ and including 7′ deep, lin. ft., ...	100	.60	60.00	1.25	125.00
(3) Trench over 5′ and including 9′ deep, lin. ft., ...	50	1.00	50.00	1.50	75.00
(4) 6″ gate valves and boxes, ...	4	17.00	68.00	25.00	100.00
(5) 6″ check valve and box, ...	1	.....	40.00	.....	30.00
(6) Concrete filter equipment, ...	1	.....	2,532.00	.....	4,960.00
(7) Filter house super-structure, ...	1	.....	2,440.00	.....	1,200.00
(8) Rock excavation, cu. yds., ...	25	3.00	75.00	3.25	81.25
	.....	.....	$5835.00	.....	$7171.25

It will be noted that the bid of Pihl & Miller of Pittsburgh was the lowest. This bid exceeded the amount available from the Legislature for this work so that the contract for the construction of the filters was again indefinitely postponed.

Weekly reports of the operation of the two waterworks pumping stations of the institution are sent to the Harrisburg office of the Department and the operation has remained under the general oversight of the Design and Construction Section of the Engineering Division as in previous years. The following table gives a summary of the daily average pumpage in gallons for both stations throughout the year.

Daily Average Pumpage by Months.

January, ...	129,970 gallons.	July, ...	154,440 gallons.
February, ...	134,530 gallons.	August, ...	155,870 gallons.
March, ...	121,930 gallons.	September, ...	193,210 gallons.
April, ...	127,420 gallons.	October, ...	191,480 gallons.
May, ...	133,160 gallons.	November, ...	164,000 gallons.
June, ...	131,440 gallons.	December, ...	134,650 gallons.

Total pumped during year, ...	53,914,900 gallons.
Daily average pumped during year, ...	147,710 gallons.
Average per capita daily consumption (1,265 population), ...	117 gallons.

Note.—The high daily average pumpage for the months of September and October is due to the fact that during these months both the steel storage tank and the concrete storage reservoir were drained and cleaned. This required the waste of 600,000 gallons of water; subtracting this amount the average daily pumpage for the year would equal 146,070 gallons.

Miscellaneous Construction.

The acetylene gas generators which supply the institution with gas for lighting are three in number. One located back of the hospital building furnishes gas for the hospital and staff building; the second generator located west of the dining building supplies all of the main buildings of the institution; the third generator located near the barns supplies gas to the Twin Cottage, the Rothrock Cottage and the administration building. The drains from the first two of these generators were connected to the sewer system of the institution while the drain from the third generator passed to an outlet in the woods on the surface of ground in the rear of the stables. It is necessary to recharge the generators about once a week and when the generators were refilled the spent carbide which consisted mostly of calcium oxide was discharged into the sewers. This chemical had apparently an inhibiting effect on the bacterial action in the settling tanks of the sewage disposal plant. As it was considerable in quantity, often amounting to 1,500 pounds a week, it was deemed advisable to disconnect the drain of each of these acetylene generators from the sanitary sewerage system and to extend them to an outlet on the surface of the ground. This was accordingly done and the drain from the hospital generator was extended a distance of approximately 325 feet into the woods in front of the building and the drain from the dining building generator was extended approximately the same distance across the public highway and into the woods north of the road. These extensions were of terra cotta pipe six inches in diameter. A small concrete settling chamber five feet by three feet in size and four feet six inches in depth having baffled inlet and outlet connections was constructed near the end of each line. These settling basins allow the heavier particles of spent carbide to settle from the water so that the overflow to the ground is practically free from sediment. This work was constructed by day labor at a nominal cost, the material required being obtained from the purchasing department.

In order that there might be adequate records of the institution as finally completed it was decided that record plans should be made. Plans of the water and sewer systems were prepared on the completion of each contract and during the year record plans were made of the location of the main steam conduit lines, of the location of the various buildings, and of the roadways on the institution grounds. These plans are of such a size that all necessary details can be shown and as the size of the drawings is uniform they can be bound into a complete record folio. It was deemed advisable to weigh the coal used daily by each fireman at the institution so as to keep an accurate record of the actual consumption and to obtain

a basis for comparison of the work of each fireman. A blank form for this work was accordingly prepared and the necessary scales ordered.

Operation of Sewage Treatment Plant.

The general oversight of the operation of the sewage treatment plant has remained under the charge of the section for Design and Construction of the Engineering Division as in previous years. The plant has been in continuous daily operation, samples for bacteriological examination have been sent to the laboratory of the Department each week and tests of the stability of the effluent from the various units have been made at the plant on an average of twice each week. The results of these tests show that the operation of the plant has been satisfactory during the year and that the effluent discharged was non-putrescible and contained only a small number of bacteria, of which none were of the colon type.

The following table gives by months the average quantity of sewage treated in gallons each twenty-four hours.

January,	134,500	July,	111,000
February,	119,400	August,	100,800
March,	160,200	September,	118,000
April,	156,500	October,	135,100
May,	138,500	November,	127,200
June,	115,000	December,	137,900

The daily average for the entire year was 129,000 gallons for twenty-four hours. The observations at the sewage treatment plant were made only between the hours of 8 A. M. and 4 P. M. and the rate is given in gallons for twenty-four hours. In order to arrive at an approximation of the total quantity of sewage treated during the twenty-four hours, it is assumed that the quantity of sewage for the eight hours between 8 A. M. and 4 P. M. is equal to the flow for the remaining sixteen hours of the day, therefore the estimated quantity of sewage for twenty-four hours is equal to two-thirds of the rate of flow in gallons for twenty-four hours as recorded during the eight hours day-time period. There is a certain amount of ground water leakage in the main sewer between the ice-pond and the sewage treatment plant, and observations taken on this line indicate that during ordinary weather which is neither dry nor extremely wet, the leakage into this line amounts to about 18,000 gallons in twenty-four hours. This leakage has also been considered in estimating the true flow of sewage. An average of thirty pounds of hypochlorite of lime daily was used for the disinfection of the effluent.

Operation of Garbage Incinerator.

The garbage incinerating plant has been operated in conjunction with the sewage treatment plant throughout the year as formerly. This incinerating plant cares for the garbage and sputum boxes from

the entire institution with the exception of a small amount of garbage from the staff building which is fed to chickens and to pigs. The following table gives a summary of the operation of the incinerating plant during the year:

Month.	Pounds garbage, daily average.	Pounds sputum boxes, daily average.	Pounds coal used, daily average.	Pounds garbage and sputum boxes to a pound of coal, daily average.
January,	2,523	400	396	7.4
February,	2,680	401	378	8.1
March,	2,773	387	338	8.1
April,	2,791	409	399	8.0
May,	2,633	391	401	7.5
June,	2,776	362	383	8.2
July,	2,660	369	406	7.5
August,	2,671	368	416	7.3
September,	2,668	373	423	7.2
October,	2,768	387	424	7.4
November,	2,632	339	403	7.4
December,	2,935	373	443	7.5
Total pounds, annually,	986,564	138,674	147,461	.....
Annual daily average,	2,703	380	404	7.6

WORK DONE FOR THE PENNSYLVANIA STATE SANATORIUM FOR TUBERCULOSIS, NO. 2, CRESSON.

Sewer System and Sewage Treatment Plant.

The annual report of the Department for 1912 gave a detailed description of this sewer system and sewage treatment plant together with an account of the advertisement and award of the contract to Julian M. Solomon, Jr., and an account of the construction completed during the year. It also recounted the fact that the contractor, due to lack of funds was unable to complete the work and that on December 5, 1912, the work was taken from the contractor's hands by the Commissioner of Health and continued by the forces of the Department in accordance with Article 7 of the contract.

After the work was taken over by the Commissioner of Health all materials were ordered through the regular purchasing office of the Department. The contractor's force of men were retained and other men employed. The plant was finished to such an extent that it could be operated early in January, and in fact was operated, but it was not finally completed until February 14th.

No extra work was performed after taking over the contract. There were, however, certain expenses caused the contractor and for which it was believed he was entitled to extra payment, as follows:

The contractor housed part of his men in wooden shanties and part of them in four conical tents. These tents are stated to cost $15.00 apiece. When cold weather began the men were all moved into the wooden houses and the tents abandoned as living quarters. The contractor sold two of these tents second-hand in Philadelphia for $7.50 apiece. The other two were retained at Cresson to cover concrete and protect it from frost while hardening. Owing to the carelessness of one of the Department's laborers on the work these two tents caught fire while being used to protect the concrete. Salamanders were placed between the fresh concrete and the canvass cover. The laborer attending the salamanders did not watch the fire closely and the tents were burned. It was decided that the contractor was entitled to payment for these two tents at the price for which he sold the other tents, or $15.00.

When the Department took over the work all of the laborers were provided with brass number checks to assist in designating them on the payroll and identifying them when paid. In case a laborer lost his brass check, fifty cents was to be deducted from his pay. This is customary on contract work throughout the country and when the Department took over the work it was the understanding that this usual custom of paying and identifying the laborers would be carried out. A certain number of the checks, fifty-one in all, were not collected from the men. This was due to the fact that the resident engineer neglected to collect the checks when paying off the men. It was decided that the contractor was entitled to payment for these checks according to the usual practice in such matters.

Unpaid Bills of Contractor.

At the time the Department took over the work the contractor had a large number of unpaid bills, including bills for materials used on the work and rental of machinery and apparatus. These bills according to statement made by the contractor and original bills filed in this office by creditors amounted to $3,160.30.

Money Paid Out by Department.

The monthly estimates on the work when it was under the contractor's charge, amounted to $9,765.99. After the work was taken from Mr. Solomon's hands all laborers and bills for material were paid by this Department. These payments were as follows:

Labor,	$4,002 23
Freight and materials,	285 22
Engineering expenses,	180 00
Total,	$4,567 45

To this amount should be added the sums paid the contractor on monthly estimates, making the total amount paid on this contract $14,333.44.

The total value of the work based on the contractor's bid and allowance for extras was $15,366.48. According to the terms of the contract the Department was liable for this amount and any balance between the value of the work and the cost of same was to be turned over to the contractor. The total value of the work is given in the following table:

(1)	2,977.5 cu. yds, trench excavation and refill @ $0.50 per cu. yd.,	$1,488 75
(2)	1,261.5 cu. yds. general excavation and refill @ $0.50 per cu. yd.,	630 75
(3)	436.2 cu. yds. rock excavation @ $2.50 per cu. yd.,	1,090 50
(4)	Top soil and seeding (omitted).	
(5)	353.5 cu. yds. Class "A" concrete @ $10.50 per cu. yd.,	3,711 75
(6)	53 cu. yds. Class "B" concrete @ $7.00 per cu. yd.,	371 00
(7)	15,869 lbs. steel reinforcing @ $0.03 per lb.,	476 07
(8)	5,656 sq. ft. expanded metal @ $0.06 per sq. ft.,	339 36
(9)	702 cu. yds. filter stone @ $1.00 per cu. yd.,	702 00
(10)	26 cu. yds. stone for sludge bed @ $1.00 per cu. yd.,	26 00
(11)	53 cu. yds. broken stone refill @ $1.10 per cu. yd.,	58 30
(12)	77 cu. yds. rubble stone masonry @ $2.50,	192 50
(13)	2 sewage siphons @ $100.00 each,	200 00
(14)	Broken stone walks (omitted).	
(15)	1 sewage screen and appurtenances,	60 00
(16)	1,004 lbs. galvanized sheet metal. etc., @ 10 cents,	100 40
(17)	20 ft. 4" t. c. pipe specials @ 20 cents,	4 00
(18)	1,913 ft. of 6" t. c. pipe @ 20 cents,	382 60
(19)	5.540 ft. of 8" t. c. pipe @ 30 cents,	1,662 00
(20)	2,332 ft. of 6" split tile @ 15 cents,	349 80
(21)	Disinfection house complete,	1,200 00
(22)	Sludge pump complete,	50 00
(23)	Chemical mixing tanks and orifice box,	150 00
(24)	2.86 tons cast iron pipe @ $45.00,	128 70
(25)	5.0 tons flanged pipe and specials @ $65.00,	325 00
(26)	10 manhole frames and covers Type A @ $25.00,	250 00
(27)	21 manhole frames and covers Type B @ $15.00,	315 00
(28)	12 sprinkling nozzles @ $5.00 each,	60 00
(29)	430 ft. of 2" gal. w. i. pipe @ 35 cents,	150 50
(30)	4 hydrants @ $25.00 each,	100 00
(31)	4—¾" stop cock valves @ $2.00 each,	8 00
(32)	3—2" gate valves @ $5.00 each,	15 00
(33)	11—3" gate valves @ $6.00 each,	66 00
(34)	4—4" gate valves @ $8.00 each,	32 00
(35)	9—6" gate valves @ $20.00 each,	180 00
(36)	3—8" gate valves @ $25.00 each,	75 00
(37)	3—6" shear gates @ $15.00 each,	45 00
(38)	3—6" sluice gates @ $25.00 each,	75 00
(39)	3—8" sluice gates @ $30.00 each,	90 00
(40)	Wooden troughs for sludge bed,	75 00
(41)	Wooden baffles Imhoff tanks and settling basins,	50 00
	Changes in wooden baffles—extra work,	40 00
		$15,325 98
	Add for 2 tents destroyed,	15 00
	51 laborers' brass checks lost at 50 cents each,	25 50
		$15,366 48

The difference between this amount and the actual cost of the work, or $1,033.04 was therefore available for settlement of the claims of the thirty creditors of the contractor.

The Department requires the contractor to furnish release of liens from all material men and sub-contractors. Inasmuch as the contractor claimed to be absolutely without financial resources, the only way that he could furnish these releases of liens would be for the contractors creditors to agree to accept their pro rata share of the money still due the contractor on this contract in lieu of all further claims against the State.

After considerable correspondence and one formal meeting all of the creditors agreed to accept the pro rata settlement with one exception. On advice from the Attorney General's Department the claim of this creditor was not recognized by the Department as it was not entirely for material or labor furnished for the work. Checks for amounts representing the various pro rata payments to each creditor were drawn, endorsed by Mr. Solomon, and turned over to the creditors on receipt of release of liens from each.

The plant has been operated during the entire year. The weekly bacteriological examinations of the quality of the effluent and the semi-weekly tests of its stability were satisfactory, both as regards bacterial content and stability. The average flow of sewage reaching the plant is given in the following table:

Gallons in 24 Hours.

April,	27,400	September,	38,700
May,	40,200	October,	43,000
June,	43,000	November,	64,400
July,	43,600	December,	64,100
August,	36,400		

The daily average for the entire year was about 45,700 gallons for twenty-four hours. The observations at the sewage treatment plant were made only between the hours of 8 A. M. and 4 P. M. and the rate on the reports submitted to the Harrisburg office is given in gallons for twenty-four hours. In order to arrive at an approximation of the total quantity of sewage during twenty-four hours, it is assumed that the quantity of sewage reaching the plant during the eight hours between 8 A. M. and 4 P. M. is equal to the flow for the remaining sixteen hours of the day, therefore the estimated quantity of sewage for twenty-four hours is equal to two-thirds of the rate of flow in gallons for twenty-four hours as recorded during the eight-hour day time period. From the reports it appears that the flow of sewage increased about fifty per cent. between June 1st and December 31st. An average of thirteen pounds of hypochlorite of lime in solution was used daily to disinfect the sewage at the treatment plant.

Waterworks System.

The main water supply system for the Cresson Sanatorium was described in detail in the annual report of this Department for 1912 together with a statement of the details of the advertisement and award of the contract to the Stitzer Engineering & Contracting Company of Philadelphia and a description of the amount of work completed during the year 1912.

It appeared that up to January 1, 1913, the contractors had completed the work to such a point that the distributing mains around the principal buildings could be used for supplying water to the

institution by a connection made to the temporary pumping station erected by the Department for use during the construction of the institution.

The contractors continued working on this system during the entire winter although they were greatly inconvenienced and put to considerable additional expense on account of the severity of the winter. The work was completed on June 16th and the final inspection made on June 18th, at which time it was found that the entire work was constructed in accordance with the terms of the contract and specifications.

The contract called for the completion of the work in 115 working days. The following table gives a statement of the working days elapsing during the construction period beginning September 13, 1912, and ending June 16, 1913:

September,	11 days.	April,	19 days.
October,	20 days.	May,	16 days.
November,	15½ days.	June,	10½ days.
December,	12 days.		
January,	9½ days.		
February,	3 days.		
March,	9½ days.	Total,	126 days.

On May 10th the contractors addressed the following letter to the Commissioner of Health, asking for an extension of time on their contract.

"Dr. Samuel G. Dixon, "May 10, 1913.
"Commissioner of Health,
"Department of Health,
"Harrisburg, Pa.

"Dear Sir:—

"We are now supplying water to the State Sanatorium for Tuberculosis within contract time, and have practically completed our entire contract with the Department of Health, with the exception of the storage reservoir.

"We consider that we would have the entire contract completed at this time if it were not for the fact that the extremely wet weather this spring has made it practically impossible for us to excavate for the storage reservoir, until very recently.

"We would therefore respectfully request that you allow us an extension of time on our contract.

"Yours very truly,
"Stitzer Engineering & Contracting Co.,
"Jas. H. Stitzer, Jr.,
"President."

After careful consideration an extension was given the contractors and reply sent them as follows:

"Stitzer Engineering & Contracting Co., "May 14, 1913.
"12th & Chestnut Streets,
"Philadelphia, Pa.

"Gentlemen:—

"Replying to your favor of May 10th, beg to say that I have taken up the matter of an extension of time on your waterworks contract at Cresson with the Commissioner of Health. He has granted you an extension of twenty working days, which, in his opinion, should be amply sufficient to allow for the wet weather this spring and which should permit you to finish the work on time.

"Very truly yours,
"C. A. Emerson, Jr.,
"Assistant Engineer."

This extension of twenty working days allowed the contractors a total of 130 working days for the completion of the contract. They consumed 126 working days so that the work was finished on contract time.

Extra Work.

Only one extra work order was issued during the course of the contract. The original plans contemplated the installation of the electric transformers on a pole at the side of the pumping station so as to be suitable for connection to the overhead electric power line from the institution power plant. After the waterworks contract was awarded it was decided that this power line should be buried beneath the ground. It also seemed advisable to increase the thickness of the walls of the main pumping station from ten inches to sixteen inches. The matter was taken up with contractors and the following proposal was received from them.

"Commissioner of Health, "October 14, 1912.
Department of Health,
"Harrisburg, Pa.

"Dear Sir:—

"We respectfully submit the following price for additional work on our contract at the sanatorium, Cresson, Pa., namely:—

"That we will increase the thickness of the walls of the main pumping station from 10 inches to 16 inches and place a small addition to the pump house, as per sketch submitted, to be used in placing of the transformers for the total sum of $345.50. It being understood that the additional concrete foundations for stone walls will be paid for under the extra concrete item. However, if it is your desire that the walls simply be increased in thickness without the addition of the transformer house, that we will make the additional thickness of wall for the sum of $8.50 per perch of 22 cubic feet. It being understood that the total outside surface of the wall be taken for this measurement and no deductions being made for openings, as this is the way the proposition was figured with your Mr. Emerson.

"We would suggest that, if you make these changes, we be sent a new print of the pumping station with the changes made thereon and that a few discrepancies on this print which we took up with your Mr. Emerson be also corrected on the new print and sent us so that there may be no contention afterwards as to just what is wanted in the pump house.

"Yours very truly,
"Stitzer Engineering & Contracting Co."

This proposal was approved and the contractors notified, as follows:

"Mr. Jas. H. Stitzer, "October 21, 1912.
"Stitzer Engineering & Contracting Co.,
"Philadelphia, Pa.

"Dear Sir:—

"Your proposal dated October 14, 1912, for increasing the thickness of the walls of the pumping station and the construction of a small transformer house at the end of the same in connection with your contract for the waterworks system for the Pennsylvania State Sanatorium for Tuberculosis at Cresson has been approved.

"The proposal as accepted was for the sum of $345.50, same to include the increase in thickness of the masonry walls at the main pumping station from 10 to 16 inches and the construction of a small masonry transformer house according to sketch recently sent you. Extra concrete in the foundation of the main building to be paid for at the price bid.

"A new plan drawing of the pumping station including these changes will be prepared and forwarded to you immediately.

"Please acknowledge receipt of this letter."

The work was constructed in accordance with this proposal.

Claims by Contractor for Extra Payment.

As previously noted the contractor experienced a great deal of difficulty in obtaining pipe and valves as well as other materials for the construction of the work. It was decided by the Commissioner of Health that the institution must be opened for patients January 1, 1913. This required the completion of the water main from the valve below the stables to the steel tank behind the institution so that this main with its service lines in the various buildings could be connected to the temporary pumping station erected by the Department. The bulletin issued with the specifications stated that the contractor would be expected to have the work in such a state of completion by December 1st that the main buildings of the institution could be supplied with water from the water company's main.

The contractor was unable to do this. On the 1st of December the line from the barns to the steel tank was completed with the exception of four valves on fire hydrant and building connections. These valves were four inches in size and their non-arrival prevented the testing of the line and the backfilling. The contractor was required to purchase these valves on the open market and they were placed about the middle of December. An attempt was then made to test the water lines although the temperature was below freezing at that time. Ordinarily the test would not have been made during this cold period but in view of the fact that the institution was to be opened in a very few days, the contractor was ordered to make the test. The four-inch valve at the connection to the east ward building and a length of four inch pipe was frozen. In order to drain the balance of the line this section of frozen pipe was broken out together with the valves, ruining both. These were later replaced by the contractor. The backfill along the entire trench from the barn to the steel tank was frozen solid. The contractor's force of men was not sufficient to refill this trench for approximately 4,200 feet in length in the time available. The Commissioner of Health offered to loan the contractor the laborers employed at the institution to assist in this work. The cost of this labor was charged to the contractors on a monthly estimate and amounted to $258.30. The frozen backfill had to be loosened with dynamite and the greater portion of it thawed with fires before it could be thrown into the trench. This work was expensive and brought the cost of this backfill far above what it would have been had the material not been frozen.

The contractor claimed that this bulletin only expressed the desire of the Department and that the only binding limit of time upon them was the count of working days which had not expired at that time. He stated that under ordinary circumstances this trench would not have been backfilled with frozen material but that it was done

at the request of the Department in order that the lines might be finished by the time patients were to be sent to the institution, and that in view of this he claimed that this charge for labor, amounting to $258.30, should not be deducted from his estimates.

The fact remained that this entire line was completed and ready for testing, with the exception of the four valves mentioned above, for a considerable period of time before the backfilling along the trenches became frozen. The contractor knew of the Department's desire to have the water lines completed around the institution buildings yet he did not make any serious attempt to buy these small valves in the open market until forced to do so by the Department. The contract for the work gave the Commissioner of Health authority to take over any part of the work he should see fit, provided the same was not progressing in a satisfactory manner. The Commissioner therefore had the power to take over this portion of the work. It would therefore appear that he was within his rights in charging the labor loaned to the contractor against the monthly estimates for the work.

Test on Pumping Equipment.

The specifications provided that the motors for operating the pumps should be tested at the factory and certified copies of these tests submitted for approval. This was done and as the test met the requirements of the specifications they were accordingly approved.

The specifications provided that tests should be made on the pumps after erection. These tests were made on April 29th and 30th and both pumps were found to meet the requirements of the specifications.

The final estimate on this work was as follows:

DEPARTMENT OF HEALTH.

ENGINEERING DIVISION.

CONTRACT NO. 17. FINAL ESTIMATE FOR WORK COMPLETED AT WATERWORKS SYSTEM FOR THE PENNSYLVANIA STATE SANATORIUM FOR TUBERCULOSIS, NO. 2, NEAR CRESSON, PENNSYLVANIA, FROM MAY 15TH TO JUNE 17, 1913.

ACCOUNT OF CONTRACT WITH STITZER ENGINEERING & CONTRACTING CO. DATED SEPTEMBER 13, 1912.

(1)	1,334 ft. of 8″ c. i. pipe (790 lbs. wt. per 12 ft. length) laid complete in trench 4 ft, to 5 ft. deep @ $1.45 per ft.,	$1,934 30
(2)	1,414 ft. of 8″ c. i. pipe (740 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5ft. deep @ $1.40 per ft.,	1,979 60
(3)	2,462 ft. of 8″ c. i. pipe (670 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5 ft. deep @ $1.30 per ft.,	3,200 60
(4)	1,790 ft. of 8″ c. i. pipe (625 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5 ft. deep @ $1.22 per ft.,	2,183 80
(5)	202 ft. of 6″ c. i. pipe (430 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5 ft. deep @ $1.00 per ft.,	202 00
(6)	3,041 ft. of 6″ c. i. pipe (400 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5 ft. deep @ $0.95 per ft.,	2,888 95
(7)	384 ft. of 4″ c. i. pipe (300 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5 ft. deep @ $0.90 per ft.,	345 60

(8)	1,226 ft. of 4″ c. i. pipe (280 lbs. wt. per 12 ft. length) laid complete in trench 4 ft. to 5 ft. deep @ $0.75 per ft.,		919 50
(9)	1,750 ft. of trenching over 5 ft. and including 7 ft. in depth @ $0.20,		350 00
(10)	762 ft. of trenching over 5 ft. and including 12 ft. in depth @ $0.80,		609 60
(11)	259¼ cu. yds. rock excavation @ $1.75 per cu. yd.,		453 69
(12)	3—8″ high pressure gate valves and boxes @ $135.00,		405 00
(13)	2—8″ medium pressure gate valves and boxes @ $25.00,		50 00
(14)	3—6″ medium pressure gate valves and boxes @ $17.50,		52 50
(15)	5—4″ high pressure gate valves and boxes @ $42.00,		210 00
(16)	14—4″ medium pressure gate valves and boxes @ $9.50,		133 00
(17)	1—6″ medium. pressure check valves with 3″ bypass @ $40.00,		40 00
(18)	2—8″ high pressure check valves with 3″ bypass @ $100.00,		200 00
(19)	8 Fire hydrants @ $32.00,		256 00
(20)	Flanged piping and valves inside pump house,		425 00
(21)	1—150,000 gallon per 24 hours triplex plunger pump,		520 00
(22)	1—720,000 gallon per 24 hours triplex plunger pump,		3,354 00
(23)	1 Motor for 150,000 gallon triplex pump,		452 00
(24)	1 Motor for 720,000 gallon triplex pump,		925 00
(25)	3 Transformers @ $256.00 each,		768 00
(26)	I Operating board and appurtenances,		285 00
(27)	1—50,000 gallon concrete receiving reservoir complete,		1,765 00
(28)	1—300,000 gal. concrete receiving reservoir complete,		4,880 00
(29)	I Pump house complete,		1,825 00
(30)	1,520 ft. of 2″ w. i. pipe @ $.115,		174 80
(31)	2 Air valves @ $17.00,		34 00
(32)	5 Locked valve boxes @ $9.00		45 00
(33)	1 Disinfection apparatus,		245 00
(34)	5 Post indicators @ $18.00,		90 00
(35)	43 cu. yds. extra earth excavation @ $1.00,		43 00
(36)	21.75 cu. yds. extra concrete @ $20.00 per cu. yd.,		435 00
	Extra work as per schedule previously filed,		345 50
			$33,025 44
	Less 20% reserved,	$6,605 09	
	Less previous payments,	25,248 19	
	Less cash labor payroll as per schedule filed,	264 30	
			32,117 58
			$907 86
	Credit by refund on cash labor payroll,		6 00
	Net total,		$913 86

June 17, 1913.

C. A. Emerson, Jr.,
Assistant Engineer in Charge.

Approved, F. Herbert Snow, Chief Engineer.

It will be noticed that the final estimate on this work placed the value of same at $33,025.44 and that the cost of the work at the time the contract was awarded, based upon the bid prices and the engineers' estimate of quantities was $32,441.00, making an increase in the cost of the work of $588.44 above the estimated cost. This amount, however, was over $2,000 less than the engineers' original estimate of the cost of doing the work. The difference in cost between the final estimate and the estimate based upon the contractor's bid price and engineers estimate of quantities is due almost entirely to the cost of the transformer house. The super-structure of this building and increasing the thickness of the walls of the main pumping station were covered by the extra work order referred to above and amounted to $345.50. The balance is due to the concrete foundations which were to be paid for at the prices bid and to some soft places which were encountered in the excavation of the building and

which necessitated the concrete foundations being carried to a greater depth than was expected in the original plan.

Throughout the progress of the work the contractor made every attempt to carry out the requirements of the specifications as to quality and workmanship in every particular as is especially shown in the construction of the reservoirs, which on testing proved to be almost absolutely watertight, as well as in the pipe section, of which approximately 1,300 feet in length stood a pressure test of 300 pounds to the square inch for six hours without any leakage. Since the completion of the pumping station a telephone line has been installed connecting it with the institution switchboard and an engineer is kept on duty day and night so that in case of fire the pumps can be started immediately.

Settlement was made with the contractor on the basis of the final estimate given above. The pumping station and waterworks system were placed in operation on April 27th and were operated during the balance of the year. No defects developed in the workmanship nor was any fault found with the design.

The elevated steel tank placed on the knoll back of the institution buildings to furnish pressure in the waterworks system and to contain water for fire purposes was described in the 1912 annual report of the Department together with an account of the advertisement of the contract and the award to the Chicago Bridge & Iron Works, and a description of the amount of work completed prior to January 1, 1913.

The work was finished on January 7th and the final inspection made on January 14th, at which time it was found that the tank was watertight and conformed to the plans and specifications as well as the terms of the contract.

A careful account was kept of the days suitable for constructing the work in accordance with the usual custom in this Department, beginning ten days after the date of signing the contract as provided in the specifications. From August 16th to January 7th, on which date the work was completed, sixty-nine days were recorded as working days, making allowance for Sundays, legal holidays, rainy days, and the period from November 15th to December 20th, during which time the contractor was delayed in his work because the water lines were not completed so that the tank could be tested.

Upon completion and acceptance of the work the contractors were paid the balance due them on the contract price of $3,950 after deducting the amounts paid on monthly estimates. It will be noted that there were no charges for extra work on this contract and that the total sums paid the contractor equaled the contract price.

After completion of the water tank an electric float alarm with annunciators in the engine room of the power and laundry building

and in the waterworks pumping station was installed under a separate contract which was supervised by the consulting mechanical engineer of the Department. This float alarm causes a bell to ring at both annunciators when the tank is full and also causes a bell to ring when the water level has dropped to a point eighteen inches below high water line in the tank.

The auxiliary water tank which was placed back of the power and laundry building to receive by means of a pipe line the condensing water from the refrigerating plant in the basement of the dining building and store it for use in the laundry was described in the 1912 annual report of this Department together with an account of the advertisement of the contract. Bids on this work were opened on January 21st. Two bids were received, as follows:

U. S. Wind Engine & Pump Co., Batavia, Ill., ...	$1,249.00
Des Moines Bridge & Iron Works, Pittsburgh, Pa., ...	1,575.00

The Des Moines Bridge & Iron Works also submitted an alternate bid on an all steel tank and on a steel tower for the price of $1,510.00. As the latter bid did not correspond with the specifications, it was not considered.

After thorough investigation the contract was awarded to the low bidders, the U. S. Wind Engine & Pump Company, at their bid price of $1,249.00.

The contract was signed February 10th and bond to the amount of fifty per cent. of the contract was filed as is required by the specifications.

Construction of Work.

The specifications stated that the concrete foundations for the tank would be furnished by this Department according to the designs submitted by the contractor. Immediately after the signing of the contract the contractor prepared and forwarded plans for these foundations. The concrete foundations were placed during the latter part of February and were ready for use when the tank materials arrived on the ground. The contractor prepared the material for the tower and tank at his shops and send the same to Cresson, where it arrived early in March. Shortly afterwards the construction gang appeared and began the work of erecting the tank, which was completed about the middle of April.

The contract required that the entire work should be completed within forty-five working days. The actual number of days consumed on the work was twenty-two, so that the tank was finished well within the contract time. The lumber in the tank is an exceptional grade of Gulf Cypress. The workmanship on the entire tank is first-class in every particular.

Partial Payments.

Acording to the terms of the contract the contractor was entitled to a fifty per cent. payment on the contract when the materials for the construction of the work arrived on the ground and had been inspected and approved. This estimate, amounting to $624.50, was paid on March 10, 1913. The contract further provided that the contractor was entitled to no further payment until the work should be finally completed, tested and approved, at which time he was to receive the balance due under the contract. This balance of $624.50 became due under these terms and was paid June 1, 1913.

This tank has been in operation since that time, fulfilling the purpose for which it was constructed. By means of it the condensing water of the refrigerating plant is used again in the laundry building so that instead of wasting several thousand gallons of water each day for condensing purposes at the refrigerating plant as is ordinarily the case, no water is wasted.

The original plans for the waterworks system for this Sanitorium contemplated the development of several springs on the western slope of the property, the drilling of a deep well, and an auxiliary pipe line to the supply line of the Summit Water Supply Company. The deep well, as described fully in preceding reports, was abandoned at a depth of 1.058 feet, water not being encountered in sufficient quantities to warrant further drilling. Work on the connection to the water company's main was commenced together with that on the pumping station and distributing lines as described in the 1912 report, and completed during 1913 as described elsewhere in this report. Funds were not available during 1912 for the development of the springs on the property and an amount sufficient for this purpose was set aside from the 1913 appropriation. It was estimated that the work would cost $6,500.00. The system as planned contemplated the collection of water by gravity from six springs with provision for the collection of water from other more distant springs should it be deemed desirable in the future and the construction of a filter plant of the rapid sand type at the pumping station.

According to the plan the main pipe line is to be of cast iron, four inches in diameter, and extend in an easterly direction from the pumping station, a distance of 400 feet, on the institution property to a junction manhole. Two branch lines lead from this manhole: one of them, of four inch cast iron pipe, approximately 1,250 feet long, extends in a southeasterly direction across a corner of the property of the Cambria Iron & Steel Company, adjoining the sanatorium. Another manhole is placed on this line at the point where it again enters the institution property. Ultimately two branch lines may extend from this manhole. The branch line now to be constructed is of three inch wrought iron pipe 400 feet in length extending parallel

to the property lines to another manhole, at which point it divides into branch lines serving three springs. Manhole No. 1 has three branch lines: one of them, four inches in diameter has already been described. Another, two inches in diameter and ninety feet long, leads to spring No. 1. The third line is three inches in diameter for a distance of 300 feet, at which point it reduces to two inches in diameter and extends a distance of approximately 900 feet to springs No. 2 and No. 3.

All of the manholes are to be constructed of stone masonry plastered outside and inside and provided with a padlocked wooden cover and overflow pipe. At each spring are collecting basins of dry rubble and rubble laid in mortar. The stonework on the upper side of the basin has open joints so that the water which comes through the ground may enter the basin and is retained by wing walls of masonry, laid with mortar joints, and the lower half of the basin until it rises to an elevation of twelve inches above the bottom of the manhole, at which point it enters the outlet pipe line. The ground behind the wing walls and immediately above the basins is to be excavated and refilled with large stones which will serve to protect the water coming from the ground from possible contamination.

The pipe lines cross shallow ravines at several points. In order to avoid excessively deep trenches, it was deemed advisable to place a culvert twelve inches in diameter in the bottom of each of these ravines and carry the pipe line across the culvert in an earth embankment.

The filters while not perhaps absolutely essential were considered to be advisable to act as a precaution against possible contamination of the water from the springs.

Water from the springs would flow first through the large concrete storage reservoir already constructed at the pumping station. Alum is to be added to the water on entering the reservoir so that it would be converted into a coagulating and sedimentation basin. From the large reservoir the settled water will flow through a six inch cast iron line to a small concrete pumping sump to be constructed under the floor of the filter house addition of the present pumping station. Water will be lifted from this sump to the level of the filters by one of two motor operated centrifugal pumps each having a capacity of 150,000 gallons in twenty-four hours.

The filters are of reinforced concrete construction, two in number, ten feet six inches in length and five feet four inches in width capable of filtering 50,000 gallons of water each in eight hours. The collecting system on the floor of the filters is of wrought iron pipe having brass strainers tapped in at intervals of six inches.

The collecting pipes are covered with ten inches of graded gravel on which was to be placed the layer of selected filter sand two feet six inches in thickness.

Loss of head gauges and rate controllers are to be provided for each unit as well as suitable piping and valves for reversing the flow of water for washing the filters and the wasting of the first filtrate immediately after washing.

Wash water is obtained by a connection four inches in diameter into the force main leading to the buildings and providing a pressure reducing valve to reduce the pressure of the wash water to ten pounds to the square inch.

Filtered water will be taken from the clear well beneath the filters by gravity through a cast iron line six inches in diameter to the present 50,000 gallon pumping reservoir back of the pumping station. From this point it is to be forced to the institution by the pumps already constructed and in operation.

Advertisement of Contract.

The contract for the construction of the water lines and filters was advertised during May 1913 and bids were received and publicly opened on May 29th. Of the four bids received that of the Pitt Construction Company, amounting to $5,425.25, based on the quantities of the engineers' estimate, was the lowest. At the time the bids were opened the Legislature had not adjourned so that the money from the appropriation was not available. Other delays followed, and finally, the Commissioner of Health decided, on July 30th, that these bids could not be held open any longer and therefore all bids were rejected. It was also decided to proceed with the construction of the water lines by day labor, ordering all the material necessary for the same through the purchasing office in Philadelphia.

Construction of the Water Lines.

Materials for the work were ordered on the 2nd of August and began to arrive the latter part of the month. Before this time excavation had been started for the trenches so that when the pipe arrived the work of laying it could begin immediately. It was not necessary to purchase any wrought iron pipe for the work, as the Department had a large stock of this pipe on hand which had been used on the temporary water supply at Cresson. This pipe was thoroughly cleaned of rust, heated and dipped in hot asphaltum paint which served as a protective coating. In general, the work was constructed in exact accordance with the contract drawings with three exceptions. The contract drawings show a connection to spring No. 2. It was found that this spring had been dry all the past summer. It was therefore believed that it would not pay, for the present at least, to make the connection to this spring. Furthermore this spring has its rise across the line on the Cambria Steel Company's property and in order to make the connection it would be necessary to dig into the

ground and find the underground stream supplying this spring and it is doubtful if this could be found without the expenditure of considerable money. If, in the future, it should be deemed desirable to find this underground stream and make the connection to the pipe line it could be done at that time as reasonably as now. The drawings showed the line from manhole No. 3 to spring basin No. 4 to be two inches in diameter. There was not sufficient two inch pipe in stock to make the line of this size but there was some inch and one-half pipe. This size is large enough to more than carry the dry weather flow from this spring and during wet weather the flow from the other springs would far more than meet the needs of the institution. The contract drawings showed a two inch line approximately 700 feet long from manhole No. 5 to spring basin No. 6. This spring was used as a part of the temporary water supply before the sanatorium was opened. An inch and a half line was laid from this spring to the old pumping reservoir which is adjacent to the spring basin now constructed and known as No. 7. It was found that this line was in good condition and that by constructing a short line about ten feet in length it could be turned into spring basin No. 7. It therefore seemed advisble not to construct the new line 700 feet in length to serve this spring unless the present line should rust out.

The work was completed and water from the spring system turned into the large reservoir at the pumping station. October 20th. On October 23rd the water from the public water line was shut off and since that time the institution has been entirely supplied with water from these springs.

If this work had been done by contract it would have cost $4,938.94. The actual cost to the Department, making use of material on hand, was $2,609.40, representing a saving of $2,329.54, with due allowance for all engineering supervision.

The cost of the work to the Department was as follows:

Labor,	$1,917 08
Material,	692 32
Total,	$2,609 40

As stated above, each manhole and spring basin is provided with a padlocked wooden cover. The institution property, however, is not fenced so that cows and trespassers are at liberty to walk over the ground immediately surrounding the springs with a possibility of pollution of the same. In order to avoid this, a temporary fence was constructed at a distance of approximately fifty feet around each spring. This fence was made by nailing the barb wire which surrounded the temporary pumping station to trees. The fence is only temporary and will be replaced by a permanent one.

The engineer at the pumping station patrols the water lines at least once a week and makes a report covering the condition of the fencing, manhole covers, etc. Since the springs have been connected to the

water system they have furnished the entire water supply for the institution and it is probable that this water will be amply sufficient for institution purposes excepting during very dry periods, when some water will have to be taken from the pipe supply.

The following table is a résumé of the operation of the water works pumping station during the year, together with a summary of the recorded flow of water from the springs.

Month.	Daily average taken from public supply in gallons.	Daily average taken from spring supply in gallons.	Daily average current used in K. W. H.
April (27th-30th),	50,000	.....	.....
May,	46,725	.....	77
June,	49,525	.....	84
July,	49,350	.....	84
August,	49,335	.....	87
September,	49,540	.....	92
October,	37,140	18,520	103
November,	.....	68,740	126
December,	.....	64,230	118

Total gallons used from Public Supply,	8,751 150
Total gallons used from Spring Supply,	4,603,430
Total gallons used at Institution,	13,354,580
Daily average consumption in gallons,	53,635
Daily average per capita consumption (400 population),	134
Total current used in kilo-watt-hours,	24,210
Gallons water pumped per kilo-watt-hours,	551
Daily average inflow from Spring Supply Oct. 27 to Dec. 31,	90,825
Maximum daily inflow from Spring Supply,	150,000
Minimum daily inflow from Spring Supply,	59,280
Cost of water used from Public Supply,	$875 12
Amount of water bills saved during year by installation of Spring Supply,	460 34
Amount saved on water bills during year in per cent. cost of installing Spring Supply,	17.6
Average quantity of hypo-chlorite of lime used in parts per million of available chlorine,	0.4

Miscellaneous Construction.

During the year certain miscellaneous engineering and construction work was designed and carried out entirely by day labor. This work is described in the following brief account.

The topography of the ground around the buildings was such that considerable grading was required in order to prevent surface water from entering the cellar windows. And the ground as left by the contractor was in such a condition that a great deal of cleaning and surfacing was necessary before lawns could be started. This work was begun early in the spring and carried on at intervals during the summer as men and teams were available. The general plan of the

work was to grade the ground for a distance varying from ten to one hundred feet from the walls so that rain water falling on the ground would be carried away from the buildings. In general the ground elevation at the building walls is about six inches lower than the sills of the cellar windows and the tops of the areas surrounding them. The excavation for the most part was clay and shale, although a great many stones ranging in size from small fragments to large boulders were encountered. The stone was separated and kept in piles for use in the roadways, for concrete, or for cutting into building stone, depending on the size of the material. The earth and shale excavated were used in filling around the buildings at points where such filling was necessary to bring the ground to the established grade. The amount of material excavated and disposed of in embankment approximated 7,000 cubic yards. The work was practically completed by the close of 1913 in readiness for a top dressing and sowing of grass seed.

The slope of the ground around the buildings is such that water from the spouts would not drain entirely away from the buildings on the surface at all points and at all places where it did flow away from the buildings the wash and damage to the surface was considerable. It was therefore believed by the Commissioner of Health advisable to construct a storm water system to care for all of the roof water from the main buildings. The system as constructed is of terra cotta pipe ranging in size from six to ten inches in diameter and has a length of 1,850 lineal feet. Of this amount 820 feet is ten inches in diameter, 660 feet eight inches in diameter, and 370 feet is six inches in diameter. There are two main lines of pipe both ten inches in diameter discharging on the surface of the ground on the hillside about ninety feet east of the east ward building. The pipes cross under the basement of this building and extend along the sides of the connecting corridor, one line on the north and the other on the south side. After passing the length of the connecting corridor the lines turn and extend around the dining building. Branches were constructed to each spout and to the drains of three basement areas in the east ward building. In all, connections were made to twenty-four spouts, three areas and three catch basins, taking care of the water from approximately 28,000 square feet of roof surface and by means of the catch basins taking care of surface water falling on the ground in the angles formed by the corners of the various buildings over an area of about an acre and a half. The entire cost of the work was in the neighborhood of $1200.

The main steam conduit extending from the power and laundry building to the east ward building, and in which is contained the high and low pressure heating and return mains, is underdrained by a

four inch open joint terra cotta pipe line. This line has outlets draining to the surface at each manhole. These outlets frequently become clogged and do not render satisfactory service. Also the water level in the ground around the power house during several months of the year stands practically at the ground surface, causing a great deal of water to accumulate in the drains of the conduit line near the point where it enters the power house. In view of these conditions it seemed advisable to construct a larger drain as an outlet to the manhole on the steam conduit line directly in front of the power house. This outlet was constructed of terra cotta pipe eight inches in diameter and approximately three hundred feet in length. It extends west from the power house, crossing the main roadway and discharging to the surface of the ground in the woods along the roadway.

The roadway from the turnpike to a point near the main buildings was constructed during 1910. Inasmuch as the surface was composed of the soft sandstone found on the property, the hauling of heavy loads over this road during the construction of the buildings caused the formation of large ruts and hollows. These places were repaired during the summer and the road surface kept in as good condition as was possible by means of a split log drag. The roadways were also extended to the various entrance doors of the main buildings. This necessitated the construction of about half a mile of roadway, which has a surfaced width of sixteen feet with a gutter on each side. In places where the flow of storm water was such that it would cause undue washing of the dirt gutter, a cobble paved gutter was constructed. First-class road surfacing material is not available on the property, as the native stone is rather soft sandstone. It was necessary to use this material for road surfacing as the Department did not wish to go to the expense of shipping in first-class road surfacing material. The Department does not have a stone crusher at Cresson. All of the stone necessary for this work was broken by hand with napping hammers as it was found that this could be done for about the same amount that it would have cost to have rented a crusher for the work. Through the courtesy of officers of the State Highway Department which were at work on the turnpike in front of the Sanatorium, we were able to borrow a steam roller to use in compacting the sub-grade and the surfacing of a part of this roadway. The binder used was a mixture of cinders from the power plant and such stone dust as was available.

No suitable place was available in the basements of the main buildings for the storage of vegetables such as potatoes, cabbages, turnips, and the like. The farm produced several hundred bushels of such vegetables during the year which it was necessary to store until used during the winter. The Commissioner of Health therefore au-

thorized the construction of a suitable vegetable cellar to be placed at some point adjacent to the dining building. The site chosen was about forty feet back of the main kitchen wing of the dining building fronting on the road. After a series of computations it was decided that the cheapest form of cellar which could be constructed would be a rectangular structure having masonry walls constructed of the stone found on the institution property, a concrete floor, and a flat reinforced concrete roof. The structure is approximately thirty feet in length, twenty feet in breadth, and eight feet high and has an available capacity of approximately 1,200 bushels. The floor level is seven feet below the surface of the ground and the earth removed from this excavation was banked three feet deep over the roof, thus preventing freezing of the contents. Entrance is provided by means of concrete steps leading from the surface of the ground down to the floor of the cellar. The interior is divided into four bins. A twelve inch ventilator leading through the roof was provided and in order to prevent any leakage through the walls six inches of broken stone was placed around all exterior walls from the bottom to the top. A four inch terra cotta drain was placed at the bottom of the wall in the broken stone and connected to the sanitary sewers. A floor drain in the floor of the vegetable cellar near the doorway with connections to the sewer allows the floor to be cleaned with a hose when desired.

It was necessary to set aside a portion of ground to be used as a cemetery for such patients of the sanatorium as die, and whose bodies are not claimed by friends or relatives. It was found that the Cresson Cemetery Association, had received a gift of ground from Mr. Andrew Carnegie on the side of the cemetery adjoining the Sanatorium property under the condition that all nationalities and races should have the privilege of burial in this plot free of charge if desired. On request of the Department the cemetery authorities set aside a section of ground for the use of the institution. This plot of ground was surveyed and laid out in places for graves. The plot contains room for approximately two hundred graves, which is considered sufficient for a great many years.

When the main buildings of the institution were left as completed by the contractors, several piles of dirt from the excavation of the cellars remained on the ground. The largest of these piles was west of the dining building and contained approximately 1,500 cubic yards. The Commissioner of Health issued instructions that this pile of dirt should be carefully surveyed so that the cost of removing same could be charged against the contractors at the time of making the final payment on the buildings, should such charge be necessary.

Report blanks were prepared for recording the daily operation of the sewage treatment plant and waterworks pumping station, the

main boiler room and engine room, and the refrigerating plant, and a form for recording a weekly inspection of the fire escapes and fire fighting apparatus. Copies of the first two reports are sent weekly to the Harrisburg office of the Department and examined and filed in the Design and Construction Section. The remaining reports are examined by the master mechanic and filed at the institution.

In 1910 a cottage situated in the Mountain House Grounds was given to the Department by Mrs. Benjamin Jones and is known as the Jones Cottage. This building was originally heated by fire-places and a small furnace which was sufficient, as the building was only occupied by its owners during the summer time and early fall. The heating plant, however, was not sufficient for occupancy of the building during severe winter weather. A hot water heating system for the building was designed and bids for the installation were requested in three different forms:—the first included the installation of the system complete with a large boiler capable of supplying hot water to the entire house with piping and radiators in each room; alternate A included the same boiler as would be required for the entire installation but with radiators only on the first floor and three rooms on the second floor; alternate B included a smaller boiler which could be increased by adding additional sections if desired and radiators and piping for the rooms included in alternate A. These bids were advertised in the fall of 1912 and opened November 11th. The complete bids as received are given in the following table:

	System complete.	Alternate "A."	Alternate "B."
John Pheister,	$1,416 00	$1,206 90	$1,161 00
Swank Hardware Co.,	1,220 35	912 79	816 79
E. J. Smith,	1,180 00	870 00	798 00
P. A. Lacy,	932 00	711 00	653 00

Money for the installation of this system was not then available. It was accordingly decided by the Commissioner of Health that the system could not be installed until after the next appropriation was received from the Legislature. In the fall of 1913 after carefully considering the matter it was decided that this system could be installed in an economical manner by the steam fitters employed continually at the institution, the material for the same being obtained through the purchasing division of the Department and the portion of the system known as Alternate B was accordingly constructed at a material saving over the cost of the work by contract.

Water was supplied to the Jones Cottage from a small reservoir on the hillside east of the Mountain House grounds. The same system also supplied the old hotel and all of the cottages around it. The system was approximately forty years old and had not been kept in good repair so that leaks developed continually and as a result it was impossible to secure a sufficient supply of water at the cottage during periods of low water in the spring fed reservoir. The Manor Real Estate and Trust Company, who are the owners of the hotel property and of many of the cottages in the grounds, stated that at the present time they would do nothing towards the repair of this distribution system. It was therefore decided by the Commissioner of Health that it would be advisable to install a separate water supply for the Jones Cottage, thus making this building independent of the old supply. On investigation it was found that there was a spring in an old picnic park across the turnpike north of the Mountain House grounds. Permission was secured from the owners of this park to install a small gasoline driven pump at the spring in order to force water to the cottage. The spring was first thoroughly cleaned and the stone walls of the same repaired and an overflow line constructed to a small pumping sump which was built adjacent to the house covering the gasolene engine driven pump. An inch and a half force line, approximately 925 feet long, was constructed to the cottage. The topography of the ground is such that this entire line could be drained by gravity at the pumping station. It was therefore only buried about twelve inches in depth excepting at points where a greater depth was required to secure the necessary grade. A small wooden tank having a capacity of approximately three hundred gallons was placed in the attic of the cottage so that it would only be necessary to operate the pump for a few minutes each day and the line could then be drained, thus doing away with the danger of freezing during severe winter weather. Inasmuch as all of the piping, the pump, engine and lumber required for this work were at hand, having been used in the temporary water supply during the building of the institution, this work was done at a nominal cost.

During the fall the Commissioner of Health authorized the preparation of plans for a stone entrance to the institution grounds and a small masonry lodge house. These plans were presented but owing to the advent of winter weather, it was not considered advisable to start the construction until the spring of 1914.

Record is kept at the institution of the amount of coal and miscellaneous freight received. In order to make these records it is necessary that each wagon load entering the property be weighed. This system has been in use at the Mont Alto Sanatorium for several years and has proved entirely satisfactory. The Commissioner of Health therefore authorized the purchase of wagon scales and the

construction of a concrete foundation for them. The foundation was constructed as required and the scales are located along the road leading from the turnpike to the institution buildings at a point about one hundred feet from the entrance.

It is necessary that the supply of fire hose at the institution should be kept at points easy of access at all times in case of fire. This fire hose is mounted on three reels, each reel containing three hundred feet. The institution also owns two forty gallon chemical tanks mounted on wheels. After careful consideration it was decided that the best method for storing this apparatus would be to construct two independent stone houses, one located east of the dining building and the other northwest of the same building, and to place a hose reel and a chemical tank in each building, the remaining hose reel to be kept at the power house. The Commissioner of Health authorized the preparation of plans for these two buildings. They are of stone masonry approximately fifteen feet square in plan, having a large double door which is fastened only by a hasp. Provision was made for heating the buildings by a small radiator supplied with steam by a line run from the heating mains in the dining building. The heating of these buildings was necessary in order to prevent freezing of the chemical tanks and deterioration of the rubber hose during severe winter weather. These plans were prepared during 1913 and the construction will be started in the spring of 1914.

The contract for the installation of the electric power line leading from the power plant to the east ward building and from the power plant to the waterworks pumping station was awarded late in the fall of 1912. The ground was frozen and if these power lines had been buried in the ground the cost would have been excessive. It was therefore deemed advisable to install the cables in a creosoted wood conduit laid on the surface of the ground for temporary use and to bury these lines during the summer of 1913 when the frost should be out of the ground. This work was started during the summer and the conduit line completed from the powerhouse to the east ward building and about two-thirds of the way from the power house to the waterworks pumping station. The line to the east ward building consists of four conduits, three being used for high tension electric cables and the fourth for a telephone line. The trench for these four conduits was approximately thirty-two inches in width. A four inch underdrain tile was laid on the bottom of the trench and surrounded with a six inch layer of broken stone. On this broken stone were laid the creosoted wooden conduits for the electric cables. The conduits were surrounded with broken stone and a layer about three inches in thickness was placed over the top. In order to prevent interference the duct for the telephone conduit was separated from the conduits for the high tension electric current by a space six inches in

width filled with broken stones. Concrete manholes were constructed approximated 350 feet apart along the line. An outlet drain was placed from each manhole so that any ground water reaching the drain is carried away and not allowed to accumulate around the conduit pipes. The position of the conduit lines in the trench between manholes was changed so as to prevent induction of the currents. The length of the conduit trench from the power house to the east ward building is approximately 1,400 feet. The line from the power house to the waterworks pumping station contains two conduits, one conduit being for the high tension electric cable which furnishes power for operating the pumping station and the other conduit for the telephone line. This conduit line is approximately 4,400 feet in length, of which about 3,000 feet were completed during the year, the construction being in all respects similar to that described for the line extending from the power house to the east ward building. The work was done by day labor and the portion completed indicates that the cost will be materially less than if it had been constructed by contract during the fall and winter of 1912.

Refuse Incinerator.

After a careful investigation it was decided that the most economical method of disposing of the refuse from the Sanatorium would be to sterilize and feed the garbage to pigs, and to incinerate the miscellaneous refuse consisting of sputum boxes, paper handkerchiefs, paper napkins, paper table cloths, and the like.

An examination of the records of the incinerating plant of the Mont Alto Sanatorium shows that the refuse from a thousand patients between December 16, 1912, and January 17, 1913, contained an average of twenty cans of sputum boxes a day. These cans of sputum boxes averaged twenty-two pounds in weight, each with a capacity of three and a half cubic feet. An incinerator for the Cresson institution should at the present time have a capacity sufficient to care for the sputum boxes from 320 patients but it was deemed advisable to ask for estimates on incinerators large enough to care for the sputum boxes for four to five hundred patients with the expectation that the extra capacity would be sufficient for general refuse disposal. Based on the figures obtained at Mont Alto the daily load of the Cresson plant would be about 240 pounds, occupying a space of approximately thirty bushels.

Four proposals for a refuse incinerator were received by this Department at its Philadelphia office. The prices quoted ranged from $300.00 to $2400.00. From an examination of the proposals as reduced to a twelve hour operating basis with capacities expressed in bushels, it was apparent that certain of the companies did not have a clear understanding of the needs of the institution. It was there-

fore deemed advisable to reject all the proposals and to prepare detailed specifications under which comparable bids would be received.

In the meantime a temporary open air burner for refuse, using wood as fuel, had been constructed at the institution. This burner has been giving fair satisfaction and it was therefore decided to continue its use and postpone the installation of a permanent incinerator until the temporary burner should be worn out.

WORK DONE FOR THE PENNSYLVANIA STATE SANATORIUM FOR TUBERCULOSIS, NO. 3, HAMBURG.

Waterworks System.

The annual report of the Department for 1912 contained a detailed description of the waterworks proposed for this institution, consisting of a pumping station and filtration plant on Mill Creek, within the limits of the property, a force main to an 85,000 gallon elevated steel tank on the hill east of the buildings with an eight inch gravity supply main from the tank to the buildings, and connections, four and six inches in size, to the individual buildings and hydrants about the grounds.

The contract for the construction of this system was publicly advertised early in May of this year. Six proposals were received and duly opened on May 28th. The bids ranged from $21,193.50 to $33,209.65. Owing to the late adjournment of the Legislature funds were not yet available for this work, and the bids were held under advisement until July 23d. As the necessary money was still inaccessible, it was decided that it would be unfair to the various contractors to hold the work open any longer. All bids were accordingly rejected on this date.

Weir readings were taken on Mill Creek at the proposed site of the pumping station and also on a branch stream known as Stine Creek which enters Mill Creek further down. These readings made it evident that the dry weather flow of the main stream is such that it would be wise to move the pumping station down stream to a point below the junction of Stine Creek with Mill Creek.

It was also decided that the general appearance of the grounds of the Sanatorium could be materially improved by placing the tank on a somewhat remoter hill on the north side of the buildings. The season was already well advanced when these changes of the plan were definitely determined, and it seemed advisable to defer a new advertisement of the contract to some time in the winter with the expectation of undertaking this construction early in the spring of 1914.

Sewerage System and Sewage Treatment Plant.

The last annual report also contained a detailed description of the sanitary sewerage system and sewage treatment plant proposed for the Hamburg Sanatorium. In brief, this system included connections to each building of the institution and an eight inch terra cotta main sewer leading to the site of the treatment plant which was to stand on the bank of Mill Creek, approximately 1,000 feet west of the institution and about seventy-five feet below the ground about the main buildings. The sewage treatment plant was to consist of a small screen chamber, two Imhoff tanks, a siphon chamber, a sprinkling filter, two re-settling basins, apparatus for adding a germicide, and a rapid sand filter of the gravity type, together with a sludge bed for drying the sludge deposited in the various units.

The contract for the construction of this work was advertised early in May, 1913. Three proposals were received and the bids were publicly opened on May 28th.

The conditions which precluded a prompt award of the contract for the water works also led to a delay in accepting bids relating to the sewage disposal. Here too the bids were all finally rejected and it was decided to defer a fresh advertisement of this contract until late in the winter and then ask for new bids for the water works system and the sewerage system at the same time.

Rock Excavation on the Site of the Main Buildings.

At the time of signing the contract for the construction of the main buildings of this Sanatorium, it was agreed by the Commissioner of Health and the contractors that all solid rock excavation should be paid for in addition to the lump sum price bid for the con struction of buildings. The excavation for the most part was dirt, soft shale and hard shale, with a comparatively small amount of solid ledge rock. In order to ascertain the amount of rock encountered the Engineering Division had a representative on the work from the first of the year to the completion of the excavation about the middle of June. Daily cost records were kept, drawings were made showing the location of all holes drilled for blasting, records were kept daily of the total amount of excavation and a series of photographs taken from time to time showing the character of the material encountered.

The only rock encountered in excavating for the east ward building was a small quantity in the north half, amounting to 110.5 cubic yards. A small amount of rock amounting to thirty-nine cubic yards, was encountered under the corridor connecting the east ward building and the dining building. In the dining building the excavation was for the most part soft and hard shale with 138 cubic yards of

solid rock encountered, for the most part, in the footings under the walls in the north wing of the building. The excavation for the connecting corridor between the dining building and west ward building as well as in the west ward building, consisted entirely of loose and hard shale, no solid rock excavation being encountered in the building. The excavation for the coal bins between the dining building and the power and laundry building and the excavation for the power and laundry building was the most difficult encountered on the work, including a total of 2,095 cubic yards of solid rock. The total amount of rock excavation allowed was 2,382.5 cubic yards.

The total amount of excavation from the time a representative of the Department was on the ground until the completion amounted to 13,955 cubic yards, on which the labor and material costs, including drilling, operation of steam shovel, transporting material, hand excavation for footings, dynamite and blasting powder but exclusive of overhead charges or depreciation, amounted to $6,283.75. This represents a cost to the contractor for excavation of 45.1 cents a cubic yard.

On the basis of this inspection a voucher was made up for payment to the contractor for 2,382.5 cubic yards of rock excavation at 75 cents a cubic yard, this being the price agreed upon at the time of signing the contract.

Roadways and Grading Around Institution Buildings.

During the year surveys were made of the embankment placed around the buildings by the general contractor, consisting of the material excavated from the cellars. With these surveys as a basis detailed plans of the finished roadways and grading around the buildings were prepared. In general it may be stated that the finished grade of the ground immediately surrounding the buildings will be about at the elevation of the sills of the basement windows and that the ground will extend on a gentle slope from this elevation to meet the original elevation of the ground so that during storms water will be drained away from the buildings, thus preventing flooding of the cellars. The main gateway to the institution will be on the State Highway immediately in front of the administration wing of the sanatorium building. From this entrance gate a winding driveway will extend to the entrance of the administration building. At this point the road will divide to the right and left; the left hand branch extending around the west ward building to the entrance of the building at the centre and the right hand branch extending around the front of the east ward building to the main entrance at the middle of this building. The entrance gate for coal, freight, and miscellaneous supplies will be on the main highway approximately 650 feet beyond the main entrance gate to the institution, at the point of entrance

of the old township road known as the Stine road which is to be repaired and made passable to the farmhouse property back of the Sanatorium buildings. At a point along this roadway near the north end of the east ward building a branch road will extend around the east ward building to the unloading platform back of the dining building as well as to the coal bins and the laundry building.

It is the expectation that this grading will be undertaken as early in the spring of 1914 as the weather permits. The roadways are to be surfaced with stone and gutters and cross drains constructed where necessary, the surfaced portion of the roadways being sixteen feet in width for the main entrance road to the institution and twelve feet in width for all auxiliary or branch roads.

Sanitary Manure Pit.

The barn on the Stine farm is in good condition and it was determined at the time of purchasing the property that this barn could serve, after minor repairs, as a stable and that by this use the construction of expensive barns could be avoided. This building is now in use for the horses which are needed in farming on the property. As the barn does not contain any satisfactory arrangements for the storage of manure, it was decided to construct a sanitary manure pit near the barn similar to the ones in use at the Cresson and Mont Alto sanatoria. After making an estimate of the number of stock which would be needed at the institution it was decided that a manure pit thirty-five feet by fifteen feet in plan, interior dimensions, would be sufficient. This size is somewhat larger than the pit at the Mont Alto Sanatorium but is not as large as the one at the Cresson Sanatorium. The walls and floor will be of concrete, the floor sloping slightly to a sump in one corner. The walls are seven feet and a half in height and so placed that the top of the concrete is approximately three feet above the present surface of the ground. Above the concrete the walls are four feet in height, of frame construction and so arranged that alternate spaces approximately four feet in width are covered with sheeting and the intermediate spaces of approximately the same width covered with copper-bronze screening, thus allowing for adequate ventilation but preventing the entrance of flies. The roof is of the gable type covered with asbestos shingles similar to those already placed on the barn. There is to be a double door at each end of the pit. The door in the end nearest the stable is to be used for wheeling manure into the pit and the doorway on the opposite end will be used for hauling manure from the pit to the fields. An inclined runway extends in the interior from the threshold of this latter doorway to the floor of the pit. The manure pit will be built when the general repairs are made to the barn, early in the spring of 1914.

Miscellaneous Surveys and Plans.

During the year a number of miscellaneous surveys were made and plans prepared. This work included a study of the method of disposal of sewage from the farm buildings which resulted in the decision that the most satisfactory method would be to construct a sanitary dry earth privy back of the building with a tight concrete cesspool for wash water and waste from the kitchen.

A study was made of the best method for supplying water to the lower barn situated on the north side of Mill Creek about opposite the future location of the sewage disposal plant. It was decided that for the present the most economical method would be to construct a fenced runway to the stream so that the stock kept at the barn could go down to the water and that in the future when the sewage disposal plant should be constructed a pipe line could be laid from the water line at the sewage disposal plant to this barn, a distance of approximately five hundred feet.

A preliminary survey was made for the location of a road through the fields north of the creek so as to provide a means of transportation for fodder between the upper and lower barns.

WORK DONE IN CONNECTION WITH THE CELEBRATION OF THE FIFTIETH ANNIVERSARY OF THE BATTLE OF GETTYSBURG.

Design and Construction of Structures.

The Department of Health was requested by His Excellency, Governor John K. Tener, to make suitable arrangements to safeguard the health of the inhabitants of Gettysburg and the multitude of visitors during the approaching celebration. The Governor had in mind not only the great gathering at the official celebration, but also the smaller throng to be expected at the Encampment of the Grand Army Veterans of Pennsylvania which was to be held from the 26th to the 28th of June, just before the main event. The accomplishment of this purpose necessitated the preparation of a large number of designs and the undertaking of a considerable amount of construction work. This work was carried on by the Section of Design and Construction under the general supervision of the Chief Engineer, and by direction of the Commissioner of Health.

After a preliminary survey, the Commissioner of Health held a consultation with the Fiftieth Anniversary Battle of Gettysburg Commission and a plan of co-operation was adopted. This plan in-

cluded such changes in the water supply and the sewer system of the borough as were needed to meet the demands of the occasion, the erection of public comfort stations, and a certain amount of special construction work in connection with the Emergency Hospital and the first aid stations which it was proposed to establish. The Commission set aside a certain sum of money to meet the expense of establishing and maintaining these conveniences for the comfort and safety of the public. This activity of the section was the subject of numerous special reports to the Commissioner of Health, and the work done has been incorporated in the account of the share of the Department in the successful conduct of the celebration which is presented elsewhere in this annual report.

WORK DONE FOR THE STATE INSTITUTIONS FOR FEEBLE-MINDED OF WESTERN PENNSYLVANIA.

Additions to Sewerage System.

This State Institution is located at Polk, Venango County. It is at present served by a sanitary sewerage system and sewage disposal plant constructed under the supervision of this Department under an act of the Legislature of 1909 appropriating funds therefor. The system as constructed serves all of the main buildings of the institution. At the time of construction of the sewerage system grease traps were installed outside of the main buildings and it was the intention ultimately to separate the waste from the kitchens carrying it through separate plumbing lines to these grease traps. It was also the intention to construct toilet houses in the boys' picnic grove and the main picnic grove on the institution grounds northwest and northeast respectively of the main buildings. It was also the intention to construct a separate house at the sewage disposal plant to serve as an office for the operator. Money for all of this work was not at that time available and the work was accordingly deferred.

Act No. 656 of the Legislature of 1911, approved June 13, 1911, the general appropriation act for the Polk Institution, made an appropriation for extension of the sewer system, as follows:

"For the extension of the sanitary sewer system, upon plans and specifications approved by the Commissioner of Health, two thousand dollars."

Upon receipt of this appropriation the superintendent of the institution requested that inasmuch as the plans for the original system were prepared and the construction superintended by this Depart-

ment, that the same procedure be carried out for the small extensions contemplated under the present appropriation. After consideration the Commissioner of Health agreed that the plan would be prepared in this Department but insisted that the institution should be responsible for the superintendence of construction.

The work as designed was divided into three portions. Two of these were small contracts and the third consisted of the portion of the work to be performed by the employees of the institution. The first contract included the operator's office at the sewage treatment plant and the toilet buildings in the boys' grove and the main grove of the institution.

The operator's office at the sewage treatment plant was to be adjacent to the chemical disinfection house and of the same design. It is a small one-story brick building ten feet square in plan and having a red tile roof. The interior is divided by wooden partitions into three small rooms, one of which could be used as a cupboard, another for a dressing room and the third, five and a half by ten feet in size, was intended for an office.

The toilet building in the boys' grove is of brick six feet square in size and provided with a slate roof. The building is equipped with two toilet fixtures of the anti-freezing type.

The building in the main grove is of similar design and is six by fourteen feet in size and divided into two separate rooms, each being provided with two toilet fixtures of the same type as those in the building in the boys grove.

The second contract included the plumbing and toilet fixtures for the two toilet buildings and also the installation of the grease lines from the institution buildings to the grease traps already constructed in the sewer systems but which up to the present time have not been connected. This contract also included slight changes in the drains from the kitchens of two of the custodial groups known as Garden Side and Lake Side.

The third portion of the work, namely that to be performed by the employees of the institution, consists of the connections from the toilet buildings to the main sewers and from the overflows of the manure pits and drains from the milk rooms in the barn to the sewers.

These plans were prepared during the spring and turned over to the authorities at the institution, who immediately advertised the two contracts and receiving favorable bids awarded the work to the lowest bidder. The construction of the buildings as well as the making of the sewer connections was completed during the summer and it is stated that these improvements to the sewerage system have been satisfactory in every detail.

12. TESTS OF WATER AND SEWAGE TREATMENT PLANTS.

The section of the Engineering Division in charge of State supervision of operation and tests conducted by the Department of the various water and sewage treatment plants operating within the State has been maintained throughout the year under the general direction of the Chief Engineer and the immediate supervision of a Principal Assistant Engineer. This section has also had supervision over the collection of all water and sewage samples for bacteriological analysis in the Department's laboratories in connection with the work of the Engineering Division.

This section in addition to this routine work has, during the year, had charge of the investigation and suppression of seven typhoid fever outbreaks and has assisted in similar work in connection with seven additional outbreaks and has under special conditions conducted eleven investigations not in accord with the routine work pertaining to water and sewage treatment.

Chlorinated lime disinfecting plants for the treatment of the public water supplies have been installed under the direction of officers of this section in five instances to meet emergency conditions.

The reports of such of the typhoid fever outbreaks as are worth detailed mention and the work of the Engineering Division incident thereto will be found elsewhere in this report as well as the reports of several of the chlorinated lime installations.

The typhoid fever outbreaks handled entirely by officers of this section were at the following places given in alphabetical order:

1. Connellsville, Fayette County.
2. Ellsworth, Washington County.
3. Lower Merion Township, Montgomery County.
4. McConnellsburg, Fulton County.
5. New Holland, Lancaster County.
6. Sharon and Farrell, Mercer County.
7. Tarentum, Allegheny County.

This section rendered assistance in the suppression of other typhoid fever outbreaks which were as follows:

1. East Berlin, Adams County.
2. Franklin, Venango County.
3. Johnsonburg, Elk County.
4. Kutztown, Berks County.
5. Limestone Township, Lycoming County.
6. Nuremberg, Schuylkill County.
7. Philadelphia, Philadelphia County.

Chlorinated lime treatment plants were installed for the treatment of five public water supplies. The location of these plants and the company or municipality for which they were installed are as follows:

1. Danville—Municipal Water Works.
2. Danville—State Hospital for the Insane.
3. Kutztown—Kutztown Water Company.
4. Port Allegany—Port Allegany Water Company.
5. West Reading—West Reading Water Company

During 1913 there were 100 water filtration plants in operation and six under construction. Six of the 100 plants were placed in operation during the year. Two of the plants appearing in the 1912 annual report of the Department have been abandoned as sources of supply for domestic purposes; first: that of the Beaver Creek Water Company near Rutherford Heights for which water from the plant of the Hummelstown Consolidated Water Company has been substituted for domestic purposes; second: the plant of the old Monessen Water Company, the water district of which is now supplied by the Tri-Cities Water Company from the enlarged plant of the old Charleroi Water Company. The six new filtration plants and twenty-nine of the plants previously in operation were inspected during the year. The new plants were inspected to learn whether or not the plans submitted to the Department and the permits issued for the construction and operation of the plans had been followed. The inspections of the old plants were made to ascertain the method of operation and efficiency. Bacteriological samples were usually collected when the inspections were made. Upon the results of inspections and analyses action was taken to improve the operation and efficiency of the plants.

The six filtration plants placed in operation during 1913, were as follows:

1. Bloomsburg—Bloomsburg Water Company.
2. East Greenville—Municipal Water Works.
3. Huntingdon—Pennsylvania Industrial Reformatory.
4. New Kensington—Kensington Water Company.
5. Reading—Municipal Water Works. Maiden Creek Plant.
6. West Conshohocken—West Conshohocken Water Company.

The six water filtration plants under construction were as follows:

1. Berwick—Berwick Water Company.
2. Dallastown—York County Consolidated Water Company.
3. Erie.—Municipal Water Works.
4. Latrobe—Latrobe Water Company.
5. Midland—Midland Water Company.
6. New Oxford—Municipal Water Works.

The twenty-nine water filtration plants built prior to 1913 and examined during the year were as follows:

1. Bristol—Municipal Water Works.
2. Brookville—Municipal Water Works.
3. Clarion—Clarion Water Company.
4. Charleroi—Tri-Cities Water Company.
5. Coatesville—Municipal Water Works.
6. Connellsville—Connellsville Water Company.
7. Danville—Municipal Water Works.
8. Danville—State Hospital for the Insane.
9. Ellwood City—Ellwood Water Company.
10. Enola—Dauphin Consolidated Water Company.
11. Falls Creek—Municipal Water Works.
12. Franklin—Municipal Water Works.
13. Freeport—Freeport Water Works Company.
14. Gettysburg—Gettysburg Water Company.
15. Hummelstown—Hummelstown Consolidated Water Company
16. Marianna—Marianna Water Company.
17. Montgomery—Montgomery Water Company.
18. Natrona—Natrona Water Company.

19. New Bethlehem—Citizens Water Company.
20. New Castle—City of New Castle Water Company.
21. New Cumberland—Riverton Consolidated Water Company
22. Quarryville—Quarryville Water Company.
23. South Bethlehem—Bethlehem City Water Company.
24. South Bethlehem—Bethlehem Steel Company.
25. Sunbury—Sunbury Water Company.
26. Tarentum—Allegheny Valley Water Company.
27. Wernersville—State Hospital for the Insane.
28. West Pittsburgh—West Pittsburgh Water Company.
29. West Reading—West Reading Water Company.

Several of the thirty-five water filtration plants inspected made improvements during the year according to suggestions from the Department of Health which were based upon the results of inspections and tests. In a few cases it became necessary to have improvements ordered through decrees from the Commissioner of Health, but many minor improvements were made through suggestions from the representatives in the field:

In the following table is shown the number of water filtration plants making chemical and bacteriological determinations and the frequency of these determinations:

Number of Water Filtration Plants Making Chemical and Bacteriological Determinations.

Frequency of Determinations.	Chemical.		Bacteriological.
	Partial.	Complete.	
None,	45	84	32
Occasional,	1	1	9
Bi-Monthly,			1
Monthly,		1	5
Bi-Weekly,		4	6
Weekly,	3	10	11
Semi-Weekly,	3		4
Tri-Weekly,			5
Daily,	48		27

By partial analyses is meant those determinations such as color, alkalinity, and turbidity that are fundamental in the operation of filter plants. By complete analyses is meant the making of mineral or sanitary chemical analyses.

Seventy-seven of the eighty-two rapid sand plants use aluminium sulphate as a coagulant. Two of the four semi-rapid and two of the fourteen slow sand plants use the same chemical as a coagulant. The amount of this chemical used to the gallon of water treated is being reduced each year. It would appear that as the use of chlorinated lime increases the use of aluminium sulphate as a

coagulant decreases. The various chemicals used and the number of plants using each are shown in the following table:

Kind of Chemical.	Number of Plants.
Aluminium sulphate,	81
Chlorinated lime,	43
Liquid chlorine,	5
Calcium oxide,	13
Sodium carbonate,	7
Iron sulphate,	5
Sodium thiosulphate,	1
No chemical,	11

During the year apparatus for the use of liquid chlorine was installed for the disinfection of the public water supply at Ashland, Schuylkill County, and at each of the water filtration plants, owned and operated by the City of Philadelphia. At the Danville Municipal Water Works apparatus for the use of sodium thiosulphate was installed to assist in the removal of tastes and odors due to excessive amounts of chlorinated lime being discharged into the river a short distance above the water works intake.

The permits issued by the Commissioner of Health for the construction and operation of water filtration plants usually require that the officials in charge of the plants shall make reports to the Department of Health concerning the operation and efficiency of the plants as operated by them. At the present time forty-eight water filtration plants report to the Department of Health each week; eleven report monthly; six report yearly, and one reports every two weeks. The reports submitted set forth a daily record of the operation of the pumping station, filter plant and laboratory. For the pumping station is shown the number of hours the raw and filtered water pumps are in action, and the number of gallons pumped. Concerning the daily operation of the filter plant is shown the number of filter units in service, the loss of head before washing, number of gallons used in washing each unit, the number of minutes the filters are allowed to filter to waste and the number of pounds of chemical used in the preparation of the water for filtration, or for sterilization after filtration. The laboratory work at the various plants differs considerably as the waters to be treated are variable. At the small plants the laboratory keeps a record of the weather and temperature of air and water; makes alkalinity, turbidity, and color determinations and makes a bacteriological examination showing the number of bacteria to the cubic centimeter in the raw and treated water and presumptive tests for B. Coli in the raw and treated water. At the large plants considerable additional laboratory work is carried on and a few make determinatins for chlorine, carbon dioxide, nitrites, and nitrates.

The accompanying chart gives the location and name of each of the hundred water filtration plants together with the name of the district in which water is furnished, population of the district, num-

PENNSYLVANIA PUBLIC WATER

	Location and Name.	Water Furnished.
1.	Apollo, Apollo Water Works Co.,	Apollo—Leechburg—West Apollo—Paulton—Oklahoma.
2.	Beaver Valley Water Co., East Vale Plant,	Beaver Valley Towns,
3.	Beaver Valley Water Co., New Brighton Plant,	Beaver Valley Towns,
4.	Bloomsburg, Bloomsburg Water Co.,	Bloomsburg,
5.	Bristol, Municipal Water Works,	Bristol,
6.	Brookville, Municipal Water Works,	Brookville,
7.	Butler, Butler Water Co.,	Butler,
8.	Cambridge Springs, Municipal Water Works	Cambridge Springs,
9.	Canonsburg, North Strabane Water Co.,	Canonsburg,
10.	Canton, Citizens Water Co.,	Canton and vicinity,
11.	Carlisle, Carlisle Gas and Water Co.,	Carlisle,
12.	Charleroi, Tri-Cities Water Co.,	Charleroi—Monessen—Donora and their environs
13.	Chester, New Chester Water Co.,	Chester and suburbs,
14.	Clarion, Clarion Water Co.,	Clarion,
15.	Coatesville, Municipal Water Works,	Coatesville,
16.	Columbia, Columbia Water Co.,	Columbia,
17.	Connellsville, Connellsville Water Co.,	Connellsville and suburbs,
18.	Danville, Municipal Water Works,	Danville,
19.	Danville, Danville State Hospital Water Works,	State Hospital for Insane,
20.	Eagles Mere, Eagles Mere Water Co.,	Eagles Mere,
21.	East Greenville, Municipal Water Works,	East Greenville and vicinity,
22.	Elizabeth, Monongahela Valley Water Co.,	Monongahela Valley towns,
23.	Ellwood City, Ellwood Water Co.,	Ellwood City and suburbs,
24.	Enola, Dauphin Consolidated Water Co.,	Enola,
25.	Ernest, Jefferson and Clearfield Coal and Iron Co.,	Ernest Village,
26.	Falls Creek, Municipal Water Works,	Falls Creek,
27.	Franklin, Municipal Water Works,	Franklin and suburbs,
28.	Freeport, Freeport Water Works Co.,	Freeport and suburbs,
29.	Gettysburg, Gettysburg Water Co.,	Gettysburg,
30.	Harrisburg, Municipal Water Works,	Harrisburg and suburbs,
31.	Holmesburg, Phila. and Bristol Water Co.,	N. Phila. suburban wards,
32.	Hummelstown, Hummelstown Cons. Water Co.,	Hummelstown and part of Swatara Twp.,
33.	Huntingdon, Huntingdon Water Supply Co.,	Huntingdon and suburbs,
34.	Huntingdon, Penna. Industrial Reformatory,	Penna. Industrial Reformatory,
35.	Indiana, Clymer Water Co.,	Indiana,
36.	Iselin, Pittsburgh Gas Coal Co.,	Iselin Village,
37.	Jenkintown, Moreland Spring Water Co.,	Jenkintown and vicinity,
38.	Jonestown, Lebanon Valley Cons. Water Supply Co.,	Lebanon and suburban dists.,
39.	Kittanning, Armstrong Water Co.,	Kittanning and Wickboro,
40.	Lancaster, Municipal Water Works,	Lancaster and suburbs,
41.	McKeesport, Municipal Water Works,	McKeesport,
42.	Marianna, Marianna Water Co.,	Marianna,
43.	Masontown, Municipal Water Works,	Masontown,
44.	Mechanicsburg, Mechanicsburg Gas and Water Co.,	Mechanicsburg and suburbs,
45.	Media, Municipal Water Works,	Media—Moylan—Wallingford,
46.	Middletown, Middletown and Swatara Cons. Water Co.,	Middletown and suburbs,
47.	Monongahela, Monongahela City Water Co.,	Monongahela and vicinity,
48.	Montgomery, Montgomery Water Co.,	Montgomery,
49.	Natrona, Natrona Water Co.,	Harrison Twp., Allegheny Co.,
50.	New Bethlehem, Citizens Water Co.,	New Bethlehem and vicinity,
51.	Newcastle, City of Newcastle Water Co.,	New Castle,
52.	New Cumberland, Riverton Cons. Water Co.	Camp Hill—Riverton—Shiremanstown—West Fair view—Wormleysburg
53.	New Kensington, Kensington Water Co.,	New Kensington—Parnassus—Arnold and North Burrell Township,
54.	Newport, Newport Home Water Co.,	Newport and vicinity,
55.	Norristown, Norristown Insurance and Water Co.,	Norristown and Bridgeport,
56.	Northeast, Municipal Water Works,	Northeast,
57.	Parkers Landing, Parker City Water Co.,	Parkers Landing and vicinity,
58.	Perkasie, Perkasie Water Supply Co.,	Perkasie,
59.	Phila.: Municipal Water Works, Upper Roxborough Plant,	Philadelphia,
60.	Phila.: Municipal Water Works, Lower Roxborough Plant,	Philadelphia,
61.	Phila.: Municipal Water Works, Belmont Plant,	Philadelphia,

FILTRATION PLANTS—1913.

Population of district.	Number of consumers.	Daily consumption in million gallons.	Source of Supply.	Water works built.	Filter Installed. (Continued on p. 946 and p. 948)
6,000	5,500	0.460	Beaver Run,	1888	1903
24,400	20,000	4.300	Beaver River,	1875	6-1892; 4-1900
12,500	10,000	2.000	Beaver River,	1876	5-1904; 2-1907
7,500	7,000	1.000	Fishing Creek,	1877	1913
9,200	7,000	1.000	Delaware River,	1875	1906
3,300	3,000	0.350	North Fork Creek,	1883	1912
20,700	16,000	2.250	Connoquessing Creek and Thorn Run,	1878	4-1902; 2-1903; 4-1906
2,000-6,000	4,000	0.150	French Creek,	1898	1908
8,000	6,000	0.900	Little Chartier's Creek,	1892	2-1910; 3-1911
2,500	2,000	0.450	Mill Creek and Nephawin Lake,	1878	1890
10,000	10,000	1.250	Conedoguinet Creek,	1851	1896
32,000	30,000	3.250	Monongahela River,	1890	6-1911; 4-1913
42,000	39,000	4.000	Delaware River,	1868	12-1903; 6-1908
2,600	2,600	0.360	Drilled Wells,	1875	1902
12,000	11,000	1.250	Sucker Run,	1867	1912
11,500	11,000	1.000	Susquehanna River,	1826	1902
15,000	13,500	1.500	Youghiogheny River,	1898	1906
7,500	7,000	1.000	N. Branch Susquehanna River,	1873	1905-1913
1,700	1,700	0.750	N. Branch Susquehanna River,	1900	1-1903; 1-1905; 2-1909
800	800	0.100	Eagles Mere Lake,	1902	1910
1,400	1,100	0.070	Perkiomen Creek,	1891	1913
17,500	14,000	1.400	Monongahela River,	1895	1901
4,500	3,800	2.600	Slippery Rock Creek,	1892	1910
1,000	950	0.100	Susquehanna River and Wells,	1905	1908
1,800	1,800	0.080	McKees Run,	1907	1907
1,300	900	0.022	Falls Creek,	....	1911
11,000	9,000	1.000	French Creek and Wells,	1865	1908
2,500	2,100	0.550	Allegheny River,	1884	1909
4,000	3,900	0.500	Marsh Creek,	1847	1894; Rebuilt 1912
70,000	70,000	9.500	Susquehanna River,	1843	1905
25,000	25,000	2.000	Sandy Run and Pennypack Creek,	1888	1-1888; 3-1893; 2-1907
11,000	8,000	1.500	Swatara Creek,	1887	1909
7,500	6,500	1.000	Standing Stone Creek,	1885	6-1900; 6-1910
800	800	0.200	Juniata River,	1889	1913
5,700	5,000	0.500	Two Lick Creek,	1898	1908
1,500	1,500	0.040	Hoopers Run and Blackleg Creek,	1904	1906
5,000	2,000	0.400	Pennypack Creek and Artesian Wells,	1909	1910
25,000	8,000	0.800	Big Swatara Creek,	1910	1911
9,000	7,500	1.200	Allegheny River,	1871	1905
50,000	48,000	7.700	Conestoga Creek,	1888	1906
42,500	42,000	4.000	Youghiogheny River,	1883	1908
1,200	1,200	0.125	Ten Mile Creek,	1908	1911
900	900	0.065	Monongahela River,	1911	1911
5,600	4,500	0.500	Yellow Breeches Creek and Springs,	1858	1909
6,000	5,500	0.500	Ridley Creek,	1854	1898-1901
6,000	5,000	0.550	Swatara Creek and Iron Mine Run,	1885	1910
8,000	5,500	0.530	Monongahela River,	1887	1904
1,500	310	0.100	Black Hole Creek and Drilled Well,	1898	1912
6,600	5,000	0.400	Springs and Allegheny River,	1908	1910
2,100	1,500	0.180	Red Bank Creek,	1883	1-1893; 1-1908
36,000	35,000	3.000	Shenango River,	1882	8-1898; 4-1904; 4-1912
5,000	2,200	0.500	Yellow Breeches Creek,	1912	1912
12,000	12,000	2.250	Allegheny River,	1890	1913
2,200	2,000	0.125	Juniata River,	1893	1909
35,000	33,000	2.600	Schuylkill River,	1847	1901
2,600	2,600	0.227	Sixteen Mile Run and Springs,	1886	1908
1,500	1,000	0.160	Allegheny River,	1891	1912
3,000	700	0.100	Railroad Run,	1911	1912
82,500	82,500	15.300	Schuylkill River,	1869	1903
63,500	63,500	11.300	Schuylkill River,	1869	1902
261,000	261,000	36.500	Schuylkill River,	1869	1906

	Location and Name.	Water Furnished.
62.	Phila.: Municipal Water Works, Torresdale Plant,	Philadelphia,
63.	Phila.: Municipal Water Works, Queen Lane Plant,	Philadelphia,
64.	Pittsburgh, Municipal Water Works,	Part of Greater Pittsburgh,
65.	Pottstown, Pottstown Gas and Water Co.,	Pottstown and Suburbs,
66.	Punxsutawney, Punxsutawney Water Co.,	Punxsutawney and Big Run,
67.	Quarryville, Quarryville Water Co.,	Quarryville,
68.	Reading, Municipal Water Works, Egelman Plant,	Reading,
69.	Reading, Municipal Water Works, Antietam Plant,	Reading,
70.	Reading, Municipal Water Works, Bernhart Plant,	Reading,
71.	Reading, Municipal Water Works, Maiden Creek Plant,	Reading,
72.	Ridgway, Municipal Water Works,	Ridgway,
73.	Royersford, Home Water Co.,	Royersford and Spring City,
74.	St. Benedict, St. Benedict Water Co.,	St. Benedict Village,
75.	Sayre and Athens, Sayre Water Co.,	Sayre and Athens,
76.	Scranton, Scranton Gas and Water Co.,	Scranton-Providence Dist.,
77.	Sharon, Sharon Water Works Co.,	Sharon and Farrell,
78.	South Bethlehem, Bethlehem City Water Co.,	Bethlehem and vicinity,
79.	South Bethlehem, Bethlehem Steel Co.,	Bethlehem Steel Works,
80.	South Pittsburgh, So. Pittsburgh Water Co.,	Pittsburgh Suburban Towns,
81.	Springfield Cons. Water Co., Neshaminy Falls Sta.,	Phila. Suburban Towns,
82.	Springfield Cons. Water Co., Pickering Creek Sta.,	Phila. Suburban Towns,
83.	Springfield Cons. Water Co., Pickering Creek Sta.,	Phila. Suburban Towns,
84.	Springfield Cons. Water Co., Springfield Sta.,	Phila. Suburban Towns,
85.	Spring Grove, P. H. Gladfelter Co.,	Spring Grove,
86.	Steelton, Municipal Water Works,	Steelton,
87.	Sunbury, Sunbury Water Co.,	Sunbury,
88.	Tarentum, Allegheny Valley Water Co.,	Tarentum and vicinity,
89.	Vandergrift, Vandergrift Water Co.,	Vandergrift and vicinty,
90.	Washington, Citizens Water Co.,	Washington and suburbs,
91.	Warren, Warren Water Co.,	Warren,
92.	Waynesburg, Waynesburg Water Co.,	Waynesburg and vicinity,
93.	Wernersville, State Hospital Water Works,	Wernersville State Hospital,
94.	West Conshohocken, West Conshohocken Water Co.,	West Conshohocken,
95.	West Pittsburgh, West Pittsburgh Water Co.,	W. Pittsburgh and vicinity.
96.	West Reading, West Reading Water Co.,	W. Reading and Wyomissing,
97.	Wilkinsburg, Pennsylvania Water Co.,	Wilkinsburg and vicinity,
98.	Wilkes-Barre, Spring Brook Water Supply Co.,	Wilkes-Barre and suburbs,
99.	Wilkes-Barre, Spring Brook Water Supply Co.,	Wilkes-Barre and suburbs,
100.	York, York Water Co.,	York and suburbs,

FILTRATION PLANTS, 1913—Continued.

Population of district.	Number of consumers.	Daily consumption in million gallons.	Source of Supply.	Water works built.	Filter Installed. Table continued on p. 948.
1,098,000	1,098,000	192.200	Delaware River,	1907	1907
102,000	102,000	49.900	Schuylkill River,	1895	1911
533,000	350,000	89.000	Allegheny River,	1826	1906–1909
17,000	16,000	2.000	Schuylkill River,	1869	1909
10,000	9,000	0.900	Clover Run and Mahoning Creek,	1887	1910
750	500	0.100	McAllisters Run,	1895	1912
3,000	3,000	0.400	Spring Run,	1903	1903
23,000	23,000	3.250	Antietam Creek,	1880	1905
18,000	18,000	2.500	Bernhart Creek,	1821	1910
57,000	57,000	8.000	Maiden Creek,	1889	1913
5,500	5,000	1.000	Big Mill Creek,	1888	1908
5,900	5,000	0.400	Schuylkill River,	1889	1893
800	700	0.030	Rock Run,	1903	1904
10,500	9,500	1.500	N. Branch Susquehanna River,	1884	1904
130,000	60,000	6.000	Leggett Creek,	1868	1910
25,000	20,000	2.960	Shenango River,	1883	4–1900; 4–1903
25,000	23,000	4.500	Lehigh River,	1885	1904
10,000	10,000	0.650	Well,	1890	1912
90,000	60,000	7.500	Monongahela River,	1895	1905
25,000	18,000	1.800	Neshaminy Falls Creek,	1910	1910
33,000	26,100	1.689	Pickering Creek,	1897	1897
22,000	17,600	1.120	Pickering Creek,	1897	1897
80,000	50,000	4.600	Crum Creek,	1896	1896
1,500	1,500	0.120	W. Branch Codorus Creek,	1884	1895
15,500	15,500	1.400	Susquehanna River,	1908	1908
14,000	13,500	3.500	Little Shamokin Cr. & Susquehanna R.	1884	6–1904; 2–1907
11,500	11,000	2.500	Allegheny River,	1886	1908
4,000	3,500	0.500	Artesian Wells,	1895	2–1897; 1–1905
20,000	14,000	1.200	Trib. Chartier's Creek,	1887	1902
11,000	8,000	1.000	Morrison Run and Allegheny River,	1882	1905
5,000	1,000	0.100	Big and Little Ten Mile Run,	1888	1902
1,000	1,000	0.250	Hospital Creek,	1894	1911
2,200	2,000	0.060	Wallace Run,	1899	1913
800	600	0.050	Beaver River,	1902	1911
2,500	2,500	0.150	Schuylkill River,	1886	1896
75,000	70,000	9.000	Allegheny River,	1888	1910
100,000	70,000	8.000	Huntsville Water Shed,	1857	1895
80,000	60,000	6.000	Crystal Lake Water Shed,	1857	1895
60,000	55,000	4.000	S. Branch Codorus Creek,	1816	1899

	Kind of Filter.	No. of units.	Total cap. in mil. gal.	Sedimentation period.	Per cent. wash water.	Controller.	Re-wash.	L. H. Gauge.	Alum coagulant.
1.	Harlow Slow Sand,	2	2.00	30 days,	....	+	+	—	—
2.	Jewell Rapid Sand,	10	5.00	4 hours,	7.0	+	+	—	+
3.	Pittsburgh Filter Mfg. Co. Rapid Sand,	7	3.50	3 hours,	7.0	+	+	—	+
4.	Pittsburgh Filter Mfg. Co. Rapid Sand,	3	1.50	4 hours,	3.0	+	+	+	+
5.	Jewell Rapid Sand,	4	2.00	2.5 hours,	3.0	+	+	+	+
6.	American Water Softener Co. Rapid Sand	2	1.00	2.5 hours,	3.0	+	+	+	+
7.	Am. Water Wks. and Guarantee Co. Rapid Sand,	10	5.00	None,	4.0	+	—	—	+
8.	Pittsburgh Filter Mfg. Co., Rapid Sand,	2	1.00	1 hour,	4.0	+	+	—	+
9.	American Water Softener Co. Rapid Sand	5	2.90	3.5 hours,	12.0	—	—	—	—
10.	N. Y. Continental Jewell Rapid Sand,	1	0.25	12 hours,	....	—	—	—	+
11.	Morrison Jewell Rapid Sand,	3	1.20	None,	5.0	+	+	—	+
12.	Chester and Fleming Rapid Sand,	10	5.00	3.5 hours,	4.0	+	+	+	+
13.	Roberts and Hodkinson Rapid Sand,	18	10.00	80 hours,	1.3	+	+	—	+
14.	N. Y. Continental Jewell Rapid Sand,	1	0.75	3 hours,	....	+	+	—	+
15.	Am. Water Soft. Co. Pressure Rapid Sand	2	1.00	45 min.,	2.5	+	+	+	+
16.	Pittsburgh Filter Mfg. Co. Rapid Sand,	4	2.00	4 hours,	11.0	+	+	+	+
17.	N. Y. Continental Jewell Pressure Rapid Sand.	3	2.00	4 hours,	5.0	—	+	+	+
18.	Jewell Rapid Sand, Remodeled by Chester & Fleming,	3	1.00	6 hours,	5.0	+	+	+	+
19.	Jewell and Amer. Softener Co. Rapid Sand,	4	1.40	45 min.,	5.0	—	+	—	+
20.	Roberts Filter Mfg. Co. Rapid Sand,	1	0.50	None,	....	+	+	—	—
21.	N. Y. Continental Jewell Rapid Sand,	1	0.35	10 hours,	....	+	+	+	+
22.	N. Y. Cont. Jewell Pressure Rapid Sand,	3	2.25	12 hours,	4.0	—	+	—	+
23.	Chapin Rapid Sand,	4	3.20	4 hours,	4.0	+	+	—	+
24.	Roberts Rapid Sand,	1	0.04	2 hours,	5.5	—	—	—	+
25.	Pittsburgh Filter Mfg. Co. Rapid Sand,	1	0.50	4 hours,	7.1	+	+	—	+
26.	Hess and Boughton Slow Sand,	2	0.50		....	—	—	—	—
27.	Greer Rapid Sand,	4	2.00	2 hours,	2.0	+	+	—	+
28.	Greer Rapid Sand,	2	1.00	8 hours,	5.5	+	+	+	+
29.	N. Y. Continental Jewell Rapid Sand,	2	1.00	8 hours,	2.0	+	+	+	+
30.	Jas. H. Fuertes Rapid Sand,	12	15.00	6.4 hours,	2.0	+	+	+	+
31.	N. Y. Cont. Jewell and Roberts Pressure Rapid Sand,	6	3.00	24 hours,	2.0	—	+	—	+
32.	Pittsburgh Filter Mfg. Co., Rapid Sand,	4	2.00	8 hours,	2.0	+	+	—	+
33.	A. P. Maignen Semi-Rapid Sand,	12	0.80	2 hours,	....	—	—	—	—
34.	Amer. Water Soft Co. Pressure Rapid Sand,	2	1.00	None,	....	—	+	—	+
35.	Roberts Filter Mfg. Co. Rapid Sand.	2	1.00	None,	....	—	+	—	+
36.	Pittsburgh Filter Mfg. Co. Rapid Sand,	1	0.06	None,	....	+	+	—	+
37.	Roberts Filter Mfg. Co. Rapid Sand,	3	1.50	3 hours,	5.0	+	+	+	+
38.	C. E. Shaup Rapid Sand,	3	3.00	4 hours,	2.0	+	+	+	+
39.	A. P. Maignen Semi-Rapid Sand,	5	2.00	24 hours,	....	—	+	—	+
40.	A. P. Maignen Semi-Rapid Sand,	15	9.00	2.25 hours,	....	—	+	+	+
41.	Pittsburgh Filter Mfg. Co. Rapid Sand,	6	6.00	10 hours,	0.6	+	+	+	—
44.	Pittsburgh Filter Mfg. Co. Rapid Sand	2	0.50	4 hours,	....	—	+	—	+
43.	Chester and Fleming Rapid Sand,	2	0.08	3.5 hours,	....	+	+	+	+
44.	Pittsburgh Filter Mfg. Co. Rapid Sand,	1	0.50	6 hours,	....	+	+	+	
45.	Robt. Witherill Pressure Rapid Sand,	2	1.00	None,	....	—	+	—	+
46.	C. E. Shaup Rapid Sand,	2	1.00	2 hours,	1.0	+	+	+	+
47.	W. B. Scaife and Sons Rapid Sand,	4	2.00	1.5 hours,	6.8	—	+	—	+
48.	Roberts Filter Mfg. Co. Rapid Sand,	1	0.57	4 hours,	5.0	+	+	+	+
49.	W. B. Scaife and Sons Rapid Sand,	2	0.50	3 hours,	12.0	+	+	—	+

FILTRATION PLANTS, 1913—Continued.

Other Chemicals.	Analyses. Chemical. Partial.	Analyses. Chemical. Complete.	Analyses. Bacteriological.	Report on operation submitted.	Remarks.
None,	None,	None,	Bi-weekly,	Weekly,	Sedimentation in dam.
Chlorinated lime, iron sulphate,	Daily,	None,	Three per week	Weekly,	
Chlorinated lime, iron sulphate,	Daily,	None,	Three per week	Weekly,	
Chlorinated lime,	Daily,	None,	Semi-weekly,	None,	
Chlorinated lime,	Daily,	None,	Daily,	Weekly,	
None,	None,	None,	None,	Weekly,	
None,	Daily,	None,	Three per week	Weekly,	Sedimentation in dam.
Sodium carbonate, chlorinated lime,	Daily,	None,	Semi-weekly,	Weekly,	
Chlorinated lime,	None,	None,	None,	None,	
Chlorinated lime,	None,	None,	None,	Monthly,	
Chlorinated lime,	None,	Monthly,	Monthly,	None,	Sedimentation in dam.
Sodium carbonate,	Daily,	None,	Occasional,	None,	
Chlorinated lime,	None,	None,	Three per week	Weekly,	
None,	Daily,	None,	Weekly,	Weekly,	Not continuously operated.
Chlorinated lime,	None,	None,	None,	Weekly,	
Chlorinated lime,	Daily,	None,	None,	None,	
Calcium oxide,	Daily,	None,	Weekly,	Weekly,	About 20% unfiltered from McCoys Run.
Calcium oxide, chlorinated lime, sodium thiosulphate,	Daily,	None,	Monthly,	None,	
Chlorinated lime,	Daily,	None,	Weekly,	Weekly,	
None,	None,	None,	None,	None,	
None,	None,	None,	None,	None,	
Calcium oxide,	Daily,	None,	Weekly,	Weekly,	
None,	Weekly,	None,	Weekly,	Weekly,	
Chlorinated lime,	None,	None,	Monthly,	Weekly,	Well water not filtered.
None,	None,	None,	None,	None,	
Chlorinated lime,	None,	None,	None,	None,	Sedimentation in dam (5,000,000 gals.)
Calcium oxide,	Daily,	None,	Weekly,	Weekly,	Well water used as additional supply.
None,	None,	None,	None,	Weekly,	
Chlorinated lime,	None,	None,	Weekly,	Weekly,	
Calcium oxide, chlorinated lime,	Daily,	Weekly,	Daily,	Weekly,	
None,	Daily,	None,	Three per week	None,	
None,	Daily,	None,	Weekly,	Weekly,	
None,	None,	None,	None,	None,	
Chlorinated lime,	None,	None,	None,	None,	Auxiliary supply.
None,	Occasional,	None,	Occasional,	Occas.,	
None,	None,	None,	None,	None,	Sedimentation in dam.
Chlorinated lime,	Daily,	None,	Daily,	Weekly,	
None,	Daily,	None,	Weekly,	Weekly,	
None,	None,	None,	None,	None,	
Calcium oxide, chlorinated lime,	None,	Weekly,	Daily,	Weekly,	
Chlorinated lime-iron sulphate, calcium oxide & sodium carbonate,	Daily,	Occasional,	Daily,	Weekly,	
Sodium carbonate,	None,	None,	None,	None,	
Chlorinated lime, sodium carbonate,	Daily,	None,	Bi-monthly,	None,	
None,	None,	None,	None,	Weekly,	
None,	None,	None,	None,	None,	Sedimentation in dam.
None,	Daily,	None,	Weekly,	Weekly,	
None,	None,	None,	None,	Weekly,	
None,	None,	None,	None,	Weekly,	Well water not filtered.
None,	None,	None,	None,	None,	Spring water not filtered.

	Kind of Filter.	No. of units.	Total cap. in mil. gal.	Sedimentation period.	Per cent. wash water.	Controller.	Re-wash.	L. H. Gauge.	Alum. coag.
50.	N. Y. Cont. Jewell and Reisert Rapid Sand,	2	0.30	10 hours,	2.0	+	+	−	+
51.	N. Y. Cont. Jewell and Amer. W. & G. Co. Rapid Sand,	16	8.00	6 hours,	5.5	+	+	+	+
52.	Pittsburgh Filter Mfg. Co. Rapid Sand	4	1.50	7 hours,	4.0	+	+	+	+
53.	Pittsburgh Filter Mfg. Co. Rapid Sand,	6	3.00	3.5 hours,	3.3	+	+	+	+
54.	C. E. Shaup Rapid Sand,	1	0.25	3 hours,	8.0	+	+	−	+
55.	N. Y. Cont. Jewell Rapid Sand,	8	4.00	2.5 hours,	2.0	+	+	+	+
56.	Hungerford-Terry Pressure Rapid Sand,	1	0.30	None,	1.5	−	+	+	+
57.	Pittsburgh Filter Mfg. Co. Rapid Sand,	1	0.15	7 hours,	5.0	+	+	+	+
58.	Roberts Filter Mfg. Co. Rapid Sand,	1	0.20	2 hours,	3.0	+	+	+	+
59.	Slow Sand,	8	20.00	9 days,	0.2	+	+	+	−
60.	Slow Sand (Preliminary Filters),	5	12.00	1.25 days,	....	+	+	+	−
61.	Slow Sand (Preliminary Filters),	18	40.00	1.69 days,	0.4	+	+	+	−
62.	Slow Sand (Preliminary Filters),	65	240.00	None,	0.2	+	+	+	−
63.	Slow Sand (Preliminary Filters),	22	70.00	3.5 days,	....	+	+	+	−
64.	Slow Sand,	46	120.00	20 hours,	....	+	+	+	+
65.	N. Y. Cont. Jewell Rapid Sand,	6	4.00	3.5 hours,	4.0	+	+	−	+
66.	Greer Pressure Rapid Sand,	4	2.00	6 hours,	....	+	+	+	+
67.	Roberts Filter Mfg. Co. Rapid Sand,	1	0.24	4 hours,	....	+	+	+	+
68.	Slow Sand,	2	0.50	16 hours,	....	+	−	+	−
69.	Slow Sand,	3	5.25	None,	....	+	−	+	−
70.	Slow Sand,	6	4.50	3 hours,	....	+	−	+	−
71.	Slow Sand,	10	15.00		....	+	−	+	−
72.	Roberts Filter Mfg. Co. Rapid Sand,	2	1.00	2 hours,	....	+	+	−	+
73.	Morrison & Jewell Rapid Sand,	3	1.25	2.5 hours,	....	−	+	−	+
74.	Norwood Engrg. Co. Pressure Rapid Sand	1	0.12	None,	....	+	−	−	+
75.	Robt. Witherill Co. Pressure Rapid Sand,	8	4.00	None,	....	−	−	−	+
76.	N. Y. Cont. Jewell Rapid Sand,	6	6.00	40 min.,	....	+	+	+	+
77.	N. Y. Cont. Jewell & Pittsburgh Filter Mfg. Co. Rapid Sand,	8	4.00	8 hours,	9.6	+	+	−	+
78.	A. P. Maignen Semi-Rapid Sand,	6	6.00	4 days,	....	−	+	+	+
79.	Roberts Filter Mfg. Co. Rapid Sand,	2	0.65	2 hours,	0.5	+	+	+	+
80.	Amer. Water Wks. & Guarantee Co. Rapid Sand,	14	14.00	17 hours,	2.0	+	+	+	+
81.	J. W. Ledoux Pressure Rapid Sand,	4	2.00	48 hours,	....	+	+	−	+
82.	Warren Rapid Sand,	6	2.40	60-72 hours,	....	−	+	−	+
83.	Slow Sand,	3	1.60	60-72 hours,	....	+	−	−	+
84.	J. W. Ledoux Pressure Rapid Sand,	10	5.40	48 hours,	....	+	+	+	+
85.	Warren & Norwich Eng. Co. Rapid Sand,	12	6.00	None,	....	−	+	−	+
86.	J. H. Fuertes Slow Sand,	3	3.00	15 min.,	2.1	+	+	+	+
87.	Pittsburgh Filter Mfg. Co. Rapid Sand,	8	4.00	1.25 hours,	5.7	+	+	+	+
88.	Roberts Filter Mfg. Co. Rapid Sand,	6	3.00	2 hours,	....	−	+	−	+
89.	N. Y. Cont. Jewell & Roberts Rapid Sand	3	1.50	20 min.,	....	+	+	−	−
90.	Pittsburgh Filter Mfg. Co. Rapid Sand,	4	3.00	12 min.,	10.0	−	−	−	+
91.	Amer. Water Wks. & Guarantee Co. Rapid Sand,	6	3.00	2.5 hours,	3.5	+	+	+	+
92.	Pittsburgh Filter Mfg. Co. Rapid Sand,	2	1.00	None,	....	−	−	−	+
93.	Chester & Fleming Rapid Sand,	2	0.65	5 hours,	2.0	+	+	+	+
94.	Roberts Filter Mfg. Co. Rapid Sand,	1	0.13	8 hours,	....	+	+	+	+
95.	W. B. Scaife Rapid Sand,	2	0.24	4.5 hours,	1.5	+	+	+	−
96.	Warren-Jewell Rapid Sand,	1	0.30	0.5 hours,	3.0	−	+	−	+
97.	Pittsburgh Filter Mfg. Co. Rapid Sand,	10	10.00	7 hours,	2.5	+	+	+	+
98.	Morrison-Jewell Rapid Sand,	20	8.00	None,	....	−	+	−	−
99.	Morrison-Jewell Rapid Sand,	12	6.00	None,	....	−	+	−	−
100.	N. Y. Cont. Jewell Rapid Sand,	12	9.00	10 days,	0.5	+	+	+	+

FILTRATION PLANTS, 1913—Continued.

Other Chemicals.	Analyses.			Report on operation submitted.	Remarks.
	Chemical.		Bacteriological.		
	Partial.	Complete.			
Sodium carbonate, ...	Daily, ...	None, ...	Occasional, .	None, ...	Raw averages 12 p. p. m. acidity.
Chlorinated lime, calcium oxide, ...	Daily, ...	None, ...	Daily, ...	Weekly,	
Chlorinated lime, ...	None, ...	None, ...	Weekly, ...	Weekly,	
Chlorinated lime, ...	Daily, ...	None, ...	Occasional, .	None, ...	
None, ...	None, ...	None, ...	Occasional, .	Weekly,	Auxiliary supply.
Chlorinated lime, ...	None, ...	None, ...	Bi-weekly, ...	Monthly,	
Chlorinated lime, ...	Semi-weekly,	None, ...	None, ...	Weekly,	Sedimentation in dam.
Chlorinated lime, ...	None, ...	None, ...	Bi-weekly, ...	Monthly,	
Chlorinated lime, ...	None, ...	None, ...	None, ...	Monthly,	Auxiliary supply.
Chlorinated lime, chlorine, ...	Daily, ...	Bi-weekly, ..	Daily, ...	Yearly, .	
Chlorinated lime, chlorine, ...	Daily, ...	Bi-weekly, ..	Daily, ...	Yearly, .	
Chlorinated lime, chlorine, ...	Daily, ...	Bi-weekly, ..	Daily, ...	Yearly, .	
Chlorinated lime, chlorine, ...	Daily, ...	Weekly, ...	Daily, ...	Yearly, .	
Chlorinated lime, chlorine, ...	Daily, ...	Bi-weekly, .	Daily.	Yearly, .	
Calcium oxide, chlorinated lime, ...	Daily, ...	Weekly, ...	Daily, ...	Yearly, .	
Chlorinated lime, ...	None, ...	None, ...	Bi-weekly, ...	Weekly, .	
None, ...	None, ...	None, ...	Monthly, ...	Monthly,	
Chlorinated lime, ...	None, ...	None, ...	None, ...	None, ...	Auxiliary supply.
None, ...	Daily, ...	Weekly, ...	Daily, ...	Weekly, .	
None, ...	Daily, ...	Weekly, ...	Daily, ...	Weekly,	
None, ...	Daily, ...	Weekly, ...	Daily, ...	Weekly,	
None, ...	Daily, ...	Weekly, ...	Daily, ...	Weekly, .	
None, ...	None, ...	None, ...	None, ...	None, ...	
None, ...	None, ...	None, ...	None, ...	None, ...	
None, ...	None, ...	None, ...	None, ...	None, ...	
None, ...	None, ...	None, ...	Occasional, ..	None, ...	
None, ...	Daily.	Weekly, ...	Daily, ...	Monthly,	
Chlorinated lime, calcium oxide, ...	Daily, ...	None, ...	Occasional, ..	Weekly, .	
Chlorinated lime, ...	None, ...	None, ...	Bi-weekly, ...	Bi-weekly	
Chlorinated lime, .	Weekly, ..	None, ...	Monthly, ...	Weekly, .	
Calcium oxide, iron sulphate, ...	Daily, ...	None, ...	Daily, ...	Weekly,	
None, ...	Daily, ...	None, ...	Daily, ...	Weekly,	
None, ...	Daily, ...	None, ...	Daily, ...	Weekly, .	
None, ...	Daily, ...	None, ...	Daily, ...	Weekly,	
None, ...	Daily, ...	None, ...	Daily, ...	Weekly,	
None, ...	None, ...	None, ...	None, ...	None, ...	Sedimentation in dam, additional industrial supply to paper mill.
Calcium oxide, chlorinated lime, ...	Daily, ...	None, ...	Daily, ...	Monthly,	
None, ...	Daily.	None, ...	Daily, ...	Monthly,	
None, ...	None, ...	None, ...	None, ...	None, ...	
None, ...	None, ...	None, ...	Occasional, ..	None, ...	
None, ...	None, ...	None, ...	None, ...	None, ...	
None, ...	Daily, ...	None, ...	Daily, ...	Weekly,	
None, ...	None, ...	None, ...	None, ...	None, ...	
Chlorinated lime, ...	Weekly, .	None, ...	Occasional, ..	Weekly,	
None, ...	None, ...	None, ...	None, ...	None, ...	Sedimentation in dam.
Calcium oxide, iron sulphate and sodium carbonate.	Daily, ...	None, ...	Bi-weekly, ...	Weekly,	
None, ...	None, ...	None, ...	None, ...	Monthly,	Sedimentation in dam.
None, ...	Daily, ...	None, ...	Daily, ...	Monthly,	
None, ...	Semi-weekly,	None, ...	Semi-weekly,	None, ...	
None, ...	Semi-weekly,	None, ...	Semi-weekly,	None, ...	Peat colored water.
Chlorinated lime, ...	Daily, ...	Weekly, ...	Daily, ...	Weekly,	

ber of consumers, million gallons consumed a day, source of supply, date when the water works was built and the purification plant installed, the kind of filters used, number of filter units in each plant, number million gallons capacity, sedimentation period, the frequency with which analyses and reports are made and data concerning the equipment of the plant and chemical used in treating the water.

INSTRUCTIVE INFORMATION CONCERNING WATER PURIFICATION IN PENNSYLVANIA

From the chart submitted it appears that there are 100 water filtration plants furnishing water to the public within the State of Pennsylvania. In construction these 100 plants represent three types as follows:

Rapid sand,	82
Semi-rapid sand,	4
Slow sand,	14
Total,	100

The following table shows the capacity and delivery of each type of plant:

Capacity,	14 slow sand plants,	534.350 mil. gals.	or	69.51%
Capacity,	4 semi-rapid sand plants,	17.800 mil. gals.	or	2.31%
Capacity,	82 rapid sand plants,	216.630 mil. gals.	or	28.18%
Total capacity,	100 filtration plants,	768.780 mil. gals.	or	100.00%

Delivery,	14 slow sand plants,	411.352 mil. gals.	or	73.81%
Delivery,	4 semi-rapid sand plants,	14.400 mil. gals.	or	2.58%
Delivery,	82 rapid sand plants,	131.580 mil. gals.	or	23.61%
Total delivery,	100 filtration plants,	557.332 mil. gals.	or	100.00%

Seventy-two of the 100 water purification plants are operated by companies, twenty-five are operated by municipalities and three are operated by public institutions. The seventy-two company plants have a capacity of 196.25 million gallons or 25.53% of the total capacity of the 100 plants. The twenty-five municipal plants have a capacity of 569.48 million galons or 74.07% of the total. The three public institutional plants have a capacity of 3.05 million gallons or 0.40% of the total. The seventy-two company plants deliver 119.450 million gallons which is 21.43% of all water filtered. The twenty-five municipal plants deliver 436.582 million gallons which is 78.34% of all the water filtered. The three institutional plants deliver 1.300 million gallons or 9.23% of all the water filtered.

During the year 1913, six new water filtration plants were placed in operation. Five of these plants are of the rapid sand type and one is of the slow sand type. Of the new rapid sand plants two are operated by companies, two by municipalities and one by a public institution. The one new slow sand plant is operated by a municipality. The five new rapid sand plants have a capacity of 5.98 mil-

lion gallons, which increased the capacity of this type over 1912 by 2.84%. The one new slow sand plant has a capacity of 15.00 million gallons which increased the capacity of this type over 1912 by 2.88%. The five new rapid sand plants have a total delivery of 3.68 million gallons which increased the delivery of this type over 1912 by 2.88%. The one new slow sand plant has a delivery of 8.00 million gallons, which increased the delivery over 1912 of this type of plant by 1.98%. The six new plants have a total capacity of 20.98 million gallons which is an increase of 2.81% over the total capacity of all the plants operating in 1912. The six new plants have a total delivery of 11.68 million gallons which is an increase of 2.12% of the total daily delivery of all the plants operating in 1912.

During the year 1913 one plant was enlarged. The Tri-Cities Water Company added four one-half million gallon units to its plant in Charleroi, thereby increasing the capacity from three to five million gallons a day. The municipal plant at Danville was remodelled and newly equipped, but the capacity was not increased.

The population of the districts in which filter plants are operated is approximately four million, or about 50% of the total population of the State, and 67% of the urban and suburban population.

The population of the districts served by the three types of filters is as follows:

District population served by slow sand plants, ...2,300,000 or 57.50%
District population served by semi-rapid sand plants, ... 92,000 or 2.30%
District population served by rapid sand plants, ...1,608,000 or 40.20%

The population receiving filtered water, known as consumers, is 3,306,260, or 40.78% of the total population and approximately 60% of the urban and suburban population.

The consumers are served filtered water from the three types of plants as follows:

Consumers served by slow sand plants, ...2,097,500 or 63.44%
Consumers served by semi-rapid sand plants, ... 85,000 or 2.57%
Consumers served by rapid sand plants, ...1,123,760 or 33.99%

The population of the districts served by the six new filtration plants is 81,500. This is an increase over 1912 of 2.19%. The population receiving filtered water from the six new plants is 80,900. This is an increase over 1912 of 2.51%.

The district population served by the seventy-two company, twenty-five municipal and three institutional filtration plants is as follows:

District population served by company slow sand plants, ... 29,000 or 1.95%
District population served by company semi-rapid sand plants..... 41,500 or 2.79%
District population served by company rapid sand plants, ...1,416,000 or 95.26%

District population served by municipal slow sand plants, ...2,269,000 or 90.04%
District population served by municipal semi-rapid plants, ... 50,000 or 1.93%
District population served by municipal rapid sand plants..... 200,000 or 7.97%

District population served by institutional slow sand plants,..... None.
District population served by institutional semi-rapid sand plants, None.
District population served by institutional rapid sand plants,.... 3,500

Company plants serve a district population of 1,486,500, or 37.16%. Municipal plants serve a population of 2,510,000, or 62.75%. Institutional plants serve a population of 3,500, or 0.09%.

The number of consumers receiving filtered water from the three types of municipal, company and institutional water purification plants is as follows:

Consumers served by company slow sand plants,..... 23,100 or 2.27%
Consumers served by company semi-rapid sand plants,..... 37,000 or 3.63%
Consumers served by company rapid sand plants,..... 959,160 or 94.10%

Consumers served by municipal slow sand plants,.....2,074,400 or 90.85%
Consumers served by municipal semi-rapid sand plants,..... 48,000 or 7.05%
Consumers served by municipal rapid sand plants,..... 161,100 or 2.10%

Consumers served by institutional slow sand plants,..... None.
Consumers served by institutional semi-rapid sand plants,..... None.
Consumers served by institutional rapid sand plants,..... 3,500 or 100.00%

Company plants serve 1,019,260 consumers or 30.83% of the total number receiving filtered water, municipal plants serve a population of 2,283,500 or 69.06% and institutional plants serve a population of 3,500 or 0.11%.

The source of water supply and the number of company, municipal and institutional plants, using each source, are designated in the following table:

Sources.	Company.	Municipal.	Institutional.	Total.
Rivers,	26	11	2	39
Small streams,	34	12	1	47
Rivers and small streams,	2	0	0	2
Rivers and wells,	1	0	0	1
Small streams and wells,	2	1	0	3
Rivers and springs,	1	0	0	1
Small streams and springs,	1	1	0	2
Small streams and lakes,	1	0	0	1
Lakes,	1	0	0	1
Wells,	3	0	0	3
Total,	72	25	3	100
Surface water only,	64	23	3	90
Ground water only,	3	0	0	3
Combined surface and ground water,	5	2	0	7
Total,	72	25	3	100

The sources of water for the district population receiving filtered water from company, municipal and institutional plants are shown in the following table:

Sources.	Company.	Municipal.	Institutional.	Total.
Rivers,	535,400	2,276,400	2,500	2,814,300
Small streams,	726,350	184,500	1,000	911,850
Rivers and small streams,	25,000	None.	None.	25,000
Rivers and wells,	1,000	None.	None.	1,000
Small streams and wells,	6,500	11,000	None.	17,500
Rivers and springs,	6,600	None.	None.	6,600
Small streams and springs,	5,000	2,600	None.	7,600
Small streams and lakes,	2,500	None.	None.	2,500
Lakes,	800	None.	None.	800
Wells,	16,600	None.	None.	16,600
Total,	1,325,750	2,474,500	3,500	3,803,750

In the following table is shown the nature of the source of supply used by each of the three types of filtration plants and the district population and number of consumers served by each.

Source of Supply and Type of Plant.	Number of Plants.	Population of District.	Consumers.
Slow sand using surface water only,	14	2,286,400	2,097,500
Slow sand plants using ground water only,	0	0	0
Slow sand plants using combined surface and ground waters,	0	0	0
Semi-rapid sand plants using surface water only,	4	91,500	85,000
Semi-rapid sand plants using ground water only,	0	0	0
Semi-rapid sand plants using combined surface and ground waters,	0	0	0
Rapid sand plants using surface water only,	72	1,376,550	1,083,300
Rapid sand plants using ground water only,	3	16,600	16,100
Rapid sand plants using combined surface and ground waters,	7	32,700	24,360
Total,	100	3,803,750	3,306,260

SEWAGE TREATMENT PLANTS.

There were eighty-one sewage treatment plants in operation within the State in 1913. Twelve sewage treatment plants were under construction. An inspection was made of twenty-six of the plants in operation. The inspections were made to learn the construction, method of operation and efficiency of the plants.

In the following table appear the name and location of each of the eighty-one plants in operation, together with the method of treatment and number of gallons sewage treated each twenty-four hours.

SEWAGE TREATMENT PLANTS OPERATING IN 1913.

No.	Name and Location.	Method of Treatment.	Gals. Treated per 24 Hrs.
1	Allegheny County Work House, O'Hara Twp.,	Septic tank, sprinkling filter, secondary tank, and sludge bed,	40,000
2	Altoona City, Blair County,	Screens and irrigation,	1,500,000
3	Blaw Steel Centering Co., O'Hara Twp., Allegheny County,	Septic tank, contact beds and sludge bed, and chlorinated lime,	15,000
4	Brittain, A. R., et al., East Stroudsburg, Monroe County,	Septic tanks and contact filters,	30,000
5	Bryn Athyn Village Association, Bryn Athyn, Moreland Twp., Montgomery County.	Septic tank, primary and secondary contact beds, sand filters, and sludge bed,	80,000
6	Buck Hill Falls Co., Buck Hill Falls, Barrett Twp., Monroe County.	Septic tank, sand filters, and sludge bed,	50,000
7	Carnegie Steel Co., near Greenville, West Salem Twp., Mercer County.	Septic tank, contact beds, and sludge bed,	12,000
8	Chambersburg Borough, Franklin County,	Imhoff tanks, sprinkling filters, secondary settling tanks, and sludge bed,	700,000
9	Chester Co. Home & Hospital for Insane, West Bradford Twp.	Imhoff tank, sprinkling filter, secondary settling tank, and chlorinated lime,	17,000
10	Chester Springs Soldiers' Orphans' School, Chester Co.,	Septic tank and percolating filters,	Not operating.
11	Cressman, Philip, for Perkasie Borough, Bucks County,	Settling tanks, contact beds, and chlorinated lime,	150,000
12	Dermady Sanatorium, Morton, Delaware County,	Septic tank and sprinkling filter,	4,000
13	Derry Borough, Westmoreland County,	Septic tanks, contact beds, and sludge bed,	500,000
14	Devon Drainage Co., Devon, Chester County,	Settling tank and irrigation,	25,000
15	Dormont Borough, Allegheny County, (3 plants),	Septic tanks and contact beds,	170,000
16	Doylestown Sewerage Co., Doylestown, Bucks County,	Settling tanks, contact beds, secondary settling tank, and chlorinated lime,	100,000
17	Eastern Penna. State Institution for the Feeble-Minded and Epileptic, near Spring City, Chester County.	Septic tanks, sand filters, and sludge bed,	160,000
18	Elk Tanning Co., tannery at Stoneham, Mead Twp., Warren Co.	Settling tank and bark filter,	50,000
19	Enola Realty Co., Enola, East Pennnsboro Twp., Cumberland County.	Septic tank and contact filters,	35,000
20	Flannery Bolt & American Vanadium Co., Collier Twp., Allegheny County.	Settling tanks and chlorinated lime,	50,000
21	Free Hospital for Poor Consumptives, White Haven, Luzerne Co.	Septic tanks, primary and secondary contact beds, and sludge beds,	18,000
22	Glen Mills Schools, Boys dept., Glen Mills, Thornbury Twp., Delaware County.	Settling tanks, contact beds and chlorinated lime,	75,000
23	Glen Mills Schools, Girls' dept., Darling, Middletown Twp., Delaware County.	Septic tank, contact bed, sand filters, and chlorinated lime,	50,000
24	Hanover Sewer Company, Hanover, York County,	Septic tank, contact beds, and chlorinated lime,	250,000
25	Haverford College, Haverford, Haverford Twp., Delaware County.	Septic tanks, contact beds, and sand filters,	15,000
26	Home & Hospital of the Good Shepherd, Villanova, Radnor Twp., Delaware County.	Settling tank, trickling filter, chlorinated lime, and sludge bed,	4,000
27	Homœopathic State Hospital for the Insane, near Allentown, Lehigh County.	Septic tanks, sand beds, and sludge bed,	200,000

28	Howard, J. W. & A. P., & Co., Ltd., Tannery, Columbus Twp., Warren County (near Corry).	Settling tanks,	100,000
29	Indiana Borough, Indiana County,	Settling tank, sprinkling filters, secondary settling tanks, and sludge bed.	300,000
30	Innwood Sanitarium, near West Conshohocken, Lower Merion Twp., Montgomery County.	Septic tank, sprinkling filter, and chlorinated lime,	10,000
31	Lebanon City, Lebanon County,	Imhoff tank, sprinkling filters, secondary setttling tank, and sludge bed,	250,000
32	Lehigh County Home & Alms House, South Whitehall Twp.,	Septic tanks, contact beds, secondary settling tank, chlorinated lime, and sludge bed.	35,000
33	Montgomery Co. Home for the Poor, Upper Providence Twp.,	Settling tank, sprinkling filters, and sludge bed,	20,000
34	Morrisville Rubber Works, Morrisville, Bucks County,	Settling tank, sand filter, and sludge bed,	25,000
35	Mt. Gretna Park, South Londonderry Twp., Lebanon County,	Septic tank (modified Imhoff), sprinkling filters, sand filters, secondary settling tank, and sludge bed.	60,000
36	Mt. Lebanon Twp., Allegheny County (2 plants),	Settling tanks, contact beds, secondary settling tanks, sludge bed, and chlorinated lime.	400,000
37	Nazareth Sewerage Company, Nazareth, Northampton County,	Settling tanks, contact bed, and chlorinated lime,	18,000
38	Nelson Valve Co., near Chestnut Hill, Springfield Twp., Montgomery County.	Septic tanks (modified Imhof), sprinkling filters, sand filters, secondary settling	60,000
39	N. J. Zinc Co., Palmerton, Carbon County,	Septic tank, contact beds, and sand beds,	65,000
40	New Wilmington Borough, Lawrence County,	Septic tank, sand filters, and sludge bed,	40,000
41	Northwestern Anti-tuberculosis League, Bells Camp, Foster Twp., McKean County.	Septic tank and contact bed,	8,000
42	Norwich Lumber Company, Norwich Twp., McKean County,	Septic tank, and sand filters,	75,000
43	Palmerton Disposal Company, Palmerton, Carbon County,	Septic tank and sand filter,	75,000
44	Parkside Hotel, Willow Grove, Moreland Twp., Montgomery County.	Septic tank, sprinkling filter, chlorinated lime, and final settling tank,	300,000
45	Pennsylvania Glue Company, Springdale, Allegheny County,	Settling tanks and sludge bed,	100,000
46	Pennsylvania Soldiers' Orphans' Industrial School, Scotland, Franklin County.	Settling tank and irrigation,	50,000
47	Pennsylvania State Lunatic Hospital, near Harrisburg, Dauphin County.	Settling tanks, sprinkling filter, secondary settling tanks, and chlorinated lime,	150,000
48	Pennsylvania State Sanatorium for Tuberculosis No. 1, Mont Alto, Franklin County.	Septic tanks, sprinkling filter, sand beds, sludge bed, and chlorinated lime,	130,000
49	Pennsylvania State Sanatorium for Tuberculosis No. 2, Cresson, Cambria County.	Imhoff tanks, sprinkling filter, secondary settling tanks, sludge bed, and chlorinated lime.	36,000
50	Pennsylvania Training School, Morganza, Washington County.	Septic tanks, sprinkling filters, secondary settling tanks, sand filters, and sludge bed.	55,000
51	Perkiomen Seminary, Pennsburg, Montgomery County,	Septic tank, contact bed, secondary settling tank, and chlorinated lime,	18,000
52	Pittsburgh Waterworks Department, sewerage, at filter plant, near Aspinwall, O'Hara Twp., Allegheny County.	Septic tanks and sand filters,	10,000
53	Pittsburgh, North side, City Home, O'Hara Twp., Allegheny County.	Septic tanks, sprinkling filters, final settling tank, and sludge bed,	160,000
54	Pleasantville Borough, Venango County,	Imhof tank, trickling filter, settling tank, and sludge bed,	50,000
55	Philadelphia City (Pennypack Creek District),	Imhoff tanks, sprinkling filters, secondary settling tanks, chlorinated lime, and sludge bed.	3,000,000
56	Philadelphia Jewish Sanatorium for Consumptives, Eagleville, Lower Providence Twp., Montgomery County.	Septic tank, contact beds, and irrigation,	3,000
57	Philadelphia Rapid Transit Company, Willow Grove Park, Moreland Twp., Montgomery County.	Septic tanks, contact filters, sand filters, chlorinated lime, and final settling tank,	200,000
58	Reading City, Berks County,	Settling tank, sprinkling filters, and secondary settling tanks,	6,500,000
59	Rumpf's Sons, Frederick, Middletown Twp., Bucks County,	Chemical precipitation and sludge bed,	60,000
60	Rush Hospital, Country Branch, near Malvern, Willistown Twp., Chester County.	Settling tank, contact bed, sand filter, and chlorinated lime,	5,000
61	St. Francis Industrial School, Eddington, Bensalem Twp., Bucks [illegible]	Modified Imhoff tank, sand filters, and sludge bed,	25,000

SEWAGE TREATMENT PLANTS OPERATING IN 1913—Continued.

No.	Name and Location.	Method of Treatment.	Gals. Treated per 24 Hrs.
62	Schuylkill County Home & Hospital, near Schuylkill Haven,	Settling tanks, contact beds, sand filters, sludge bed, and chlorinated lime,	160,000
63	Seybert Institution, Meadowbrook, Abington Twp., Montgomery County.	Imhoff tank, sprinkling filter, secondary settling tank, sludge bed, and chlorinated lime.	15,000
64	Somerset County Home & Hospital, Somerset,	Settling tank and contact beds,	16,000
65	State Asylum for the Chronic Insane of Pennsylvania, Wernersville, Berks County.	Septic tanks, sprinkling filters, secondary settling tanks, sludge bed, and chlorinated lime.	100,000
66	State Hospital for the Criminal Insane, Farview Station, Wayne County, (temporary plant).	Settling tank, and chlorinated lime,	30,000
67	State Hospital for the Insane, at Danville, Montour County,	Settling tanks, sprinkling filters, secondary settling tank, sludge bed, and chlorinated lime.	425,000
68	State Hospital for the Insane of the Southeastern District, Norristown, Montgomery County.	Settling tanks, sprinkling filters, secondary settling tanks, sludge bed, and chlorinated lime.	200,000
69	State Institution for the Feeble Minded of Western Pennsylvania, Polk, Venango County.	Settling tanks, sprinkling filters, sludge bed, and chlorinated lime,	225,000
70	State Police Barracks, near Greensburg, Westmoreland County.	Septic tank and trickling filter,	60,000
71	Tressler Orphans' Home, Loysville, Tyrone Twp., Perry County.	Irrigation,	20,000
72	Universal Portland Cement Company, Universal, Penn Twp., Allegheny County.	Septic tank, secondary settling tank, and chlorinated lime,	10,000
73	Valley Camp Association, Lower Burrell Twp., Westmoreland County.	Settling tanks and chlorinated lime,	20,000
74	Villanova College, Villanova, Radnor Twp., Delaware County.	Settling tank and contact beds,	45,000
75	Warren Water Company, sewerage at filter plant, near Warren, Warren County.	Settling tank and sand filter,	100
76	Washington and East Washington Boroughs, Washington County.	Septic tanks, sprinkling filters, and secondary settling tanks,	2,200 000
77	Wayne Sewerage Company, Wayne, Delaware County,	Settling tanks, primary and secondary contact beds, sand filters, and chlorinated lime.	700,000
78	West Chester Borough, Chester County (2 plants),	Septic tanks, sprinkling filters, secondary settling tanks, and sludge beds,	1,000 000
79	Western Pennsylvania Hospital for the Insane, Dixmont, Kilbuck Twp., Allegheny County.	Settling tanks, contact beds, sprinkling filters, and sludge bed,	85,000
80	Williamson Free School of Mechanical Trades, Middletown Twp., Delaware County.	Septic tanks, trickling filters, and sand filters,	30,000
81	Wood, Alan, Iron & Steel Company, Ivy Rock Station, Plymouth Twp., Montgomery County.	Settling tanks, contact beds, and secondary settling tanks,	50,000

The twelve sewage treatment plants under consideration during 1913 were as follows:

1. Allegheny County Home and Hospital for Insane, Collier Township.
2. Bethany Orphans' Home, Heidelberg Township, Berks County.
3. Bristol Borough, Bucks County.
4. Carlisle Borough, Cumberland County.
5. Delaware County Home of Employment, Middletown Township.
6. Ligonier Borough, Westmoreland County.
7. Masonic Home, near Elizabethtown, West Donegal Township, Lancaster County.
8. Middle Coal Field Poor District, Lehigh Township, Carbon County.
9. Pennsylvania Industrial Reformatory, near Huntingdon, Huntingdon County.
10. Pennsylvania State College, Centre County.
11. Scranton Poor District, Hillside Home, Newton Township, Lackawanna County.
12. State Hospital for the Insane at Warren, Warren County.

The twenty-six sewage treatment plants inspected during the year 1913 were as follows:

1. Brittain, A. R., et al., East Stroudsburg, Monroe County.
2. Bryn Athyn Village Association, Bryn Athyn, Moreland Township, Montgomery County.
3. Buck Hill Falls Company, Buck Hill Falls, Barrett Township, Monroe County.
4. Chambersburg Borough, Franklin County.
5. Derry Borough, Westmoreland County.
6. Haverford College, Haverford, Haverford Township, Delaware County.
7. Homœopathic State Hospital for the Insane, near Allentown, Lehigh County.
8. Lebanon City, Lebanon County.
9. Lehigh County Home and Almshouse, South Whitehall Township.
10. New Wilmington Borough, Lawrence County.
11. Pennsylvania Soldiers' Orphans' Industrial School, Scotland, Franklin County.
12. Pennsylvania State Lunatic Hospital, near Harrisburg, Dauphin County.
13. Pennsylvania State Sanatorium for Tuberculosis No. 1, Mont Alto, Franklin County.
14. Pennsylvania Training School, Morganza, Washington County.
15. Pleasantville Borough, Venango County.
16. Philadelphia City (Pennypack Creek District).
17. Reading City, Berks County.
18. Seybert Institution, Meadowbrook, Abington Township, Montgomery County.
19. Schuylkill County Home and Hospital, near Schuylkill Haven.
20. State Hospital for the Insane at Danville, Montour County.
21. State Institution for Feeble Minded of Western Pennsylvania, Polk, Venango County.
22. St. Francis Industrial School, Eddington, Bensalem Township, Bucks County.
23. Washington and East Washington Boroughs, Washington County.
24. Wayne Sewerage Company, Wayne, Delaware County.
25. West Chester Borough, Chester County (2 plants).
26. Williamson Free School of Mechanical Trades, Middletown Township, Delaware County.

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13. SPECIAL WORK.

During the year the Department has continued work upon a sanitary survey of the Monongahela River drainage basin, including a comprehensive investigation of the discharge of mine wastes. The studies of the sewerage and water works of towns in this district and their relation to the whole are set forth in the permits and decrees issued to these places from time to time and have been enumerated in this report under these headings.

The special operations looking to the early improvement of sanitary conditions in the Schuylkill River drainage basin above the Philadelphia intakes have been continued during the year. Plans for sewage treatment works have been approved for some of the towns and the construction work will be followed up and progress is being made by other towns toward the same end.

A special sanitary patrol of the drainage basin of Perkiomen Creek, a tributary of the Schuylkill, was conducted during the late summer and fall for the purpose of lessening the so-called vacation typhoid in Philadelphia and suburban towns. The Chief Engineer mapped out the patrol in the field. Further mention is made of this work in connection with a tyhoid outbreak which occurred in Sellersville.

The operations of the Department in connection with the celebration of the Fiftieth Anniversary of the battle of Gettysburg including the erection of an emergency hospital and comfort stations and the adaption of the water and sewerage systems of the town to the demands of the occasion are summarily mentioned in the report of the Section of Design and Construction and detailed in the special report of the Commissioner.

In addition to the routine work of investigation on which the formal sewerage and water works permits are based, Assistant Engineers of the Department conducted special investigations of a number of nuisances and complaints.

The more important of these special investigations were Buck Hill Falls Inn sewerage and Wyoming and Swoyersville swamp nuisances by Assistant Engineer Hooker; Port Clinton private water supplies by Assistant Engineer Irwin; Carlisle Gas and Water Company and Orwigsburg sewerage and several of the Schuylkill River towns, referred to above in a general way, by Assistant Engineer Ennis; Mechanicsburg Gas and Water Company (broken main) by Assistant Engineer Moses; Woodlawn sewerage by Assistant Engineer Riddle; and Landisville sewerage by Assistant Engineer Parke.

Certain special investigations are outlined below under separate headings.

A—INVESTIGATION OF SPRINGFIELD WATER COMPANY'S PLANTS BECAUSE OF TYPHOID FEVER AND COMPLAINTS IN THE DISTRICT.

The public water supply furnished in Lower Merion Township, Montgomery County, by the Springfield Consolidated Water Company was investigated thoroughly by officers of this Department in January of the current year and numerous samples for bacteriological analysis at the Department's Laboratory were collected from different parts of the distributing system and from the reservoirs and filter plants from which water is supplied not only to Lower Merion Township but to about a hundred thousand other persons in the suburban districts west and southwest of Philadelphia. The water company makes regular detail reports to this Department of the operations at its filter plants, as do other companies throughout the State. Moreover, the Department regularly collects occasional samples from different parts of the system for bacteriological analysis as a check upon the work of the company.

The special investigation in January was made because six cases of typhoid fever had occurred in Ardmore Village, Lower Merion Township; one November 20th and five from December 20th to 27th, 1912. Earlier in that year there had been a

not excessive number of cases scattered throughout the township totalling seventeen for the year. It was thought best to investigate the public water supply thoroughly. However, no suspicious circumstances were revealed.

The milk supply and other conditions which might have had a bearing on the typhoid were looked into by the board of health of Lower Merion Township.

During 1912 the State Department of Health approved and authorized the installation of improved apparatus to bring the equipment at the Pickering Creek and Crum Creek filter plants of the Springfield Consolidated Water Company thoroughly up-to-date. These plans were submitted in accordance with the formal requirements of the Department based upon prior careful investigations of the entire water works system. Plans were also approved for the installation of a new filtration plant on Neshaminy Creek to furnish water to the districts of the company east of the Schuylkill River, previously supplied from the other districts.

The improvements at the old filter plants and the construction of the new filter plant were completed in accordance with the provisions of this Department during the summer of 1913 and were placed in commission. Moreover, the reconstruction of the gravity rapid sand filters, comprising one of the plants at the Pickering Creek Station, is in progress and will be completed early in the coming year.

A second comprehensive investigation of the system, together with the collection of samples on a number of days from representative points in the system was made in the fall of the current year at the same time that the investigation was being conducted in Philadelphia relative to the prevalence of typhoid fever in that city. It was desired that every precaution should be taken to guard again any mishap in the operation of this extensive suburban water works system at the time when typhoid fever was so prevalent in the city. The presence of the disease in the community had made the public unusually suspicious and a number of complaints were received relative to the Springfield water and it was necessary that this Department should keep intimately in touch with the operation of the system.

Sanitary inspections of the Crum Creek and Pickering Creek drainage areas were conducted by officers of the Department during the year in accordance with the established policy and these inspections are referred to under the heading of "Field Inspection, Improvement of Watersheds, Philadelphia Suburbs."

B—INVESTIGATION FOLLOWING THE MARCH FLOOD IN THE ALLEGHENY BASIN.

Between March 29th and April 1st, 1913, an investigation was made by Assistant Engineer Paul Hooker with a view to preventing the outbreak of epidemics following the disastrous flood which occurred in the latter part of March 1913, affecting the Allegheny River and its western tributaries. The investigation covered those towns whose water supplies might be affected or menaced and where the scattering of polluting matter in the flooded area might result in an outbreak of disease, and included Cambridge Springs, Meadville and Franklin along French Creek and Oil City, Kittanning and Ford City along the Allegheny River.

At Cambridge Springs raw water from French Creek had been pumped into the system and instructions were given covering flushing out of the system, and thorough disinfection, as well as warning the public to boil all water used for domestic purposes.

At Meadville it was ascertained that no raw water had been admitted to the distributing system.

At Franklin the water supply was not affected by the flood. The local officials were warned of the danger of an epidemic due to the overflowing of portions of the town, and cautioned to exercise great care and diligence in the matter of cleaning and disinfection.

At Oil City raw Allegheny River water had found its way into the distributing system through flooding of the pumping station. Instructions were given to disinfect the system immediately and thoroughly, to clean the reservoirs and flush the mains. The suggestion was made and carried out by the public authorities that the public be warned through the press of the danger of an epidemic, and urged to boil all water and use disinfectants liberally while cleaning up the flooded portions of the town.

At Kittanning the water supply was not contaminated by the flood, but a large portion of the borough was flooded leaving deposits of mud from one to several inches in depth. At the suggestion of the Department notices were printed in the local papers warning the people of the danger of an epidemic, urging them to clean up their premises immediately, and quoting a telegram from Doctor Dixon urging the boiling of water and other precautions. At the suggestion of the Department representative arrangements were made for the free general distribution of lime and also for the disinfection of the streets with chlorinated lime applied by means of a street sprinkling cart.

At Ford City the water works pumping station was not flooded, but the local officials were instructed to warn the people to boil the water as an additional precaution. About two-thirds of the town had been flooded to a depth of eight to ten feet, and serious damage and inconvenience resulted. Privies were extensively used and these were overturned and the contents strewn over the borough along with the mud deposited by the flood. Following the conference with the local authorities when the danger of an epidemic was pointed out to them, the matter of cleaning up

was given a strong impetus. The officials of the local plant of the Pittsburgh Plate Glass Company generously undertook and carried out the task of cleaning up and disinfecting the town.

The fact that no epidemics occurred as a result of the flood and the attendant menace is undoubtedly due in a large measure to the prompt warnings and effective precautions taken.

C—PLUMBING OF BERKS COUNTY PRISON.

At the Berks County Prison in Reading modern sanitary plumbing fixtures and piping were installed during 1913 as the result of a thorough investgiation and recommendations relative to the former plumbing of the prison by this Department.

This special investigation and report by this Department were made at the instance of the secretary of the State Board of Public Charities and of the Berks County Prison Board of Inspectors. In accordance with the Department's recommendations, the County Commissioners had comprehensive plans prepared for the renewal of the entire plumbing system of the prison, which plans were approved by this Department.

IV. FIELD INSPECTION.

There are three distinct kinds of work performed by the sanitary inspectors.

The first is detail work of stream preservation and is on the upland watersheds sparsely populated and of small area where inspection and patrol can easily prevent pollution of the waters of the State, except by accident.

The second is the work on large watersheds whereon may be located villages, towns and cities, the drainage of which goes into a stream subsequently used as a source of public water supply. The refinements in sanitation readily accepted as practicable for the upland watersheds would be impracticable if enforced on these lower watersheds. In the latter instance two safeguards are necessary, the diminution of sewage pollution as far as practicable, and the filtration of the water supply.

The third kind of work of the field officers relates to various insanitary conditions with respect to disposal of household wastes and causes of disease and mortality within or without villages, boroughs, and cities more fully mentioned under "General Sanitation."

The improvement of watersheds whose yield is wholly or materially drawn upon for domestic consumption has demanded and received attention in one hundred and fifty-seven instances, involving the water supply of ten cities, one hundred and fourteen boroughs, twenty of which are County Seats, twenty five villages, two State Institutions and one County Institution, and five industrial supplies.

14. IMPROVEMENT OF WATERSHEDS.

There were inspected or reinspected during the year eighty-one thousand and fifty-four properties, located on two hundred and thirty five watersheds. Of the eighty-one thousand and fifty-four properties, all were found satisfactory except twenty thousand and seven.

Abatement of nuisances totalling eleven thousand, one hundred and thirty-four were effected on six thousand, one hundred and fifty-three of these properties. At the close of the year there were thirteen thousand, eight hundred and seventy-nine properties upon which nuisances remained unabated.

The *ten cities* whose water supplies were inspected or re-inspected are as follows:—Hazleton, Johnstown, Lancaster, New Castle, Philadelphia Suburbs, Reading, Scranton, Wilkes-Barre, Williamsport, and York.

1. The City of Hazleton, Luzerne County, is supplied with water from Quakake Creek, by the Wyoming Valley Water Company. Seven of the properties on the watershed were inspected, and all but two were found to be in a satisfactory condition. The two unsatisfactory properties remained unchanged at the close of the year.

2. The City of Johnstown, Cambria County, is supplied with water by the Johnstown Water Company from Mill Creek, St. Clair, Laurel, Dalton, Hinckston, Wild Cat, and Salt Lick Runs. Fifty-nine of the properties on the watersheds were inspected and all but thirteen were found to be in a satisfactory condition. Nine pollutions were abated on eight of the unsatisfactory properties, leaving five properties in an unsatisfactory condition at the close of the year. Part of the city is supplied with water by the Morrellville and Cambria Borough Water Company from Strayer Run. Two unsatisfactory properties on the watershed were reinspected, and two pollutions on the two unsatisfactory properties were abated, leaving all the properties on the watershed in a satisfactory condition at the close of the year.

3. The City of Lancaster, Lancaster County, is supplied with water from the Conestoga Creek. Eighteen unsatisfactory properties on the watershed were reinspected, and sixteen pollutions upon nine of the unsatisfactory properties were abated, leaving nine properties on the watershed in an unsatisfactory condition at the close of the year.

4. The City of New Castle, Lawrence County, is supplied with water by the City of New Castle Water Company, from the Shenango River. Eight unsatisfactory properties on the watershed were reinspected and nine pollutions upon five of the unsatisfactory properties were reported to be abated, leaving three properties on the watershed in an unsatisfactory condition at the close of the year.

5. Certain Philadelphia suburbs are supplied with water by the Springfield Consolidated Water Company from Neshaminy, Crum, and Pickering Creeks. Eleven hundred and two of the properties on the watersheds were inspected, and all but one hundred and thirty-nine were found to be in a satisfactory condition. Seventy pollutions were abated upon thirty-nine of the unsatisfactory properties leaving one hundred unsatisfactory properties on the watersheds at the close of the year, one of which was referred to the Department's Attorney for adjustment.

6. The City of Reading, Berks County, is supplied with water from Maiden, Antietam, and Bernhart Creeks, and Egelman Reservoir. Seven hundred and sixty of the properties on the watersheds were inspected and all but one hundred and ninety-six were found to be in a satisfactory condition. Ninety-six pollutions were abated upon sixty-two of the unsatisfactory properties, leaving one hundred and thirty-four unsatisfactory properties on the watersheds at the close of the year, one of which was referred to the Department's Attorney for final adjustment.

7. The City of Scranton, Lackawanna County, is partly supplied with water by the Scranton Gas & Water Company, from Roaring Brook. Two unsatisfactory properties on the watershed were inspected, and one pollution upon one of the unsatisfactory properties was abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

8. The City of Wilkes-Barre, Luzerne County, is supplied with water by the Spring Brook Water Supply Company, from Gardner's, Harvey's, Rattlesnake, Panther, and Mill Creeks, and from Harvey's Lake, Laurel Run, Spring Brook, Falling Springs, and Huntsville Reservoir. Three hundred and sixty-six of the properties on the watersheds were inspected, and all but fifty-six were found to be in a satisfactory condition. Seventy-seven pollutions upon thirty-seven of the unsatisfactory properties were abated, leaving nineteen unsatisfactory properties on the watersheds at the close of the year.

9. The City of Williamsport, Lycoming County, is supplied with water by the Williamsport Gas and Water Company from Mosquito Creek. The fifteen properties on the watershed were inspected, and all but two were found to be in a satisfactory condition. The two unsatisfactory properties remained unchanged at the close of the year.

10. The City of York, York County, is supplied with water from Codorus Creek. Two hundred and one unsatisfactory properties on the watershed were re-

inspected, and eighty-five pollutions were abated upon thirty-two of the unsatisfactory properties, leaving one hundred and sixty-nine properties in an unsatisfactory condition on the watershed at the close of the year.

The *twenty boroughs,* which are county seats, whose water supplies were inspected, or reinspected, are as follows:

1. Bedford Borough, the County Seat of Bedford County, is supplied with water from Buffalo Creek. Two unsatisfactory properties on the watershed were reinspected, and one pollution upon one unsatisfactory property was abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year.
2. Bloomsburg Borough, the County Seat of Columbia County, is supplied with water by the Bloomsburg Water Company from Fishing Creek. Ten unsatisfactory properties on the watershed were inspected or reinspected, all of which remained unchanged at the close of the year.
3. Carlisle Borough, the County Seat of Cumberland County, is supplied with water by the Carlisle Gas & Water Company from Conodoguinet Creek. Two thousand and twenty-eight of the properties on the watershed were inspected and all but one hundred and ninety-one were found to be in a satisfactory condition. Seventy-one pollutions were abated upon forty-eight unsatisfactory properties, leaving one hundred and forty-three properties on the watershed in an unsatisfactory condition at the close of the year.
4. Chambersburg Borough, the County Seat of Franklin County, is supplied with water from Hosack and Birch Runs. The nine camps on the watersheds were inspected and seven of them were found to be in an unsatisfactory condition. Ten pollutions were abated in the seven unsatisfactory camps, leaving all camps on the watersheds in a satisfactory condition at the close of the year.
5. Clearfield Borough, the County Seat of Clearfield County, is supplied with water by the Clearfield Water Company from Moose and Montgomery Creeks. Eight camps on the watersheds were inspected and seven of them were found to be in an unsatisfactory condition. Two pollutions were abated in one unsatisfactory camp, leaving six camps on the watersheds in an unsatisfactory condition at the close of the year.
6. Doylestown Borough, the County Seat of Bucks County, is supplied with water from artesian wells, springs, and a tributary to Neshaminy Creek. Two unsatisfactory properties on the watershed were reinspected, and two pollutions upon the two unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.
7. Ebensburg Borough, the County Seat of Cambria County, is supplied with water from Black Lick Creek. One unsatisfactory property on the watershed was reinspected and one pollution upon the unsatisfactory property was abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.
8. Gettysburg Borough, the County Seat of Adams County, is supplied with water by the Gettysburg Water Company from Marsh Creek and drilled wells. The five hundred and ninety-four properties on the watershed were inspected and all but seventy-four were found to be in a satisfactory condition. One hundred and thirty-two pollutions upon the seventy-four unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year. Two of the unsatisfactory properties had been adjusted through reference to the Department's Attorney.
9. Hollidaysburg Borough, the County Seat of Blair County, is supplied with water from Blair Gap Run. The two camps on the watershed were inspected, one of which was found to be in an unsatisfactory condition. Seven pollutions were abated in the one unsatisfactory camp, leaving the watershed in a satisfactory condition at the close of the year.
10. Honesdale Borough, the County Seat of Wayne County, is supplied with water by the Honesdale Water Company from Balcon Creek. Two unsatisfactory properties on the watershed were reinspected, and eight pollutions upon these two properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.
11. Indiana Borough, the County Seat of Indiana County, is supplied with water by the Clymer Water Company from Two Lick Creek. Sixteen unsatisfactory properties on the watershed were reinspected, and two pollutions upon one unsatisfactory property were abated, leaving fifteen properties on the watershed in an unsatisfactory condition at the close of the year.
12. Media Borough, the County Seat of Delaware County, is supplied with water from Ridley Creek. Eighty of the properties on the watershed were inspected and all but twelve were found to be in a satisfactory condition. Five pollutions were abated upon three of the unsatisfactory properties, leaving nine properties on the watershed in an unsatisfactory condition at the close of the year.
13. Mercer Borough, the County Seat of Mercer County, is supplied with water by the Mercer Water Company from Otter Creek. Twenty-six unsatisfactory properties on the watershed were reinspected, and thirteen pollutions were abated upon nine of the unsatisfactory properties, leaving seventeen properties in an unsatisfactory condition on the watershed at the close of the year.

14. Ridgway Borough, the County Seat of Elk County, is supplied with water by the Ridgway Water Company from Big Mill Creek. The seventeen properties on the watershed were reinspected and found to be in a satisfactory condition.

15. Stroudsburg Borough, the County Seat of Monroe County, is supplied with water by the Stroudsburg Water Supply Company from Broadheads Creek. The one thousand two hundred and thirty-four properties on the watershed were inspected, and all but fifty-one were found to be in a satisfactory condition. Eight pollutions were abated upon six unsatisfactory properties, leaving forty-five properties on the watershed in an unsatisfactory condition at the close of the year.

16. Sunbury Borough, the County Seat of Northumberland County, is supplied with water by the Sunbury Water Company from Little Shamokin Creek. Two unsatisfactory properties on the watershed were reinspected and six pollutions upon the two unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

17. Towanda Borough, the County Seat of Bradford County, is supplied with water by the Towanda Water Company from Towanda Creek, Satterslee Run, and a spring. The sixty-one properties on the watersheds were inspected and all but eight were found to be in a satisfactory condition. Ten pollutions were abated upon six of the unsatisfactory properties, leaving two unsatisfactory properties on the watersheds unchanged at the close of the year.

18. Waynesburg Borough, the County Seat of Greene County, is supplied with water by the Waynesburg Water Company from Ten Mile Creek. Thirty-three unsatisfactory properties on the watershed were reinspected and thirty-seven pollutions upon twenty-three of the unsatisfactory properties were abated, leaving ten properties on the watershed in an unsatisfactory condition at the close of the year.

19. Wellsboro Borough, the County Seat of Tioga County, is supplied with water by the Wellsboro Water Company from Charleston Creek and Mickle and Rock Runs. One unsatisfactory property on the watersheds was reinspected and three pollutions on this property were abated, leaving all properties on the watersheds in a satisfactory condition at the close of the year.

20. West Chester Borough, the County Seat of Chester County, is supplied with water from Chester Creek. Eight unsatisfactory properties on the watershed were reinspected and twenty pollutions upon six of the unsatisfactory properties were abated, leaving two properties on the watershed in an unsatisfactory condition at the close of the year. These two unsatisfactory properties were referred to the Department's Attorneys for final adjustment.

The *ninety-four other Boroughs* whose water supplies were inspected or reinspected are as follows:

1. Albion Borough, Erie County, is supplied with water from springs. The two properties on the drainage area were inspected and found to be in a satisfactory condition.

2. Apollo Borough, Armstrong County, is supplied with water by the Apollo Water Works Company from Beaver Run. Seventeen unsatisfactory properties on the watershed were reinspected and twenty-four pollutions upon sixteen of the unsatisfactory properties on the watershed were reinspected and twenty-four pollutions upon sixteen of the unsatisfactory properties were abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

3. Arendtsville Borough, Adams County, is supplied with water by the Arendtsville Water Company from a spring run. One unsatisfactory property on the watershed was reinspected and the saw dust from this abandoned saw mill was removed, leaving the watershed uninhabited and in a satisfactory condition at the close of the year.

4. Ashland Borough, Schuylkill County, is supplied with water from Little Mahanoy Creek. One hundred and forty-five properties on the watershed were reinspected, and three hundred and nineteen pollutions were abated upon one hundred and twenty-seven of the unsatisfactory properties, leaving eighteen unsatisfactory properties on the watershed at the close of the year.

5. Austin Borough, Potter County, is supplied with water from three wells, four springs, and Freeman's Run. Twenty unsatisfactory properties on the watersheds were reinspected and twenty-four pollutions were abated upon five of the unsatisfactory properties, leaving fifteen properties on the watersheds in an unsatisfactory condition at the close of the year.

6. Avis Borough, Clinton County, is supplied with water by the Chatham Water Company from Chatham Run. Three unsatisfactory properties on the watershed were reinspected and four pollutions upon the three unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

7. Bangor Borough, Northampton County, is supplied with water by the Bangor Water Company from Martin's Creek. Four of the properties on the watershed were inspected and all but one were found to be in a satisfactory condition. The one unsatisfactory property remained unchanged at the close of the year.

8. Barnesboro Borough, Cambria County, is supplied with water by the Northern Cambria Water Company from Brown's Run. The three properties on the watershed were inspected, two of which were found to be in an unsatisfactory condition. Two pollutions were abated upon the two unsatisfactory properties, leaving all the properties on the watershed in a satisfactory condition at the close of the year.

9. Bath Borough, Northampton County, is supplied with water from Hatch Gravel Creek. The fifteen properties on the watershed were inspected and all but two were found to be in a satisfactory condition. One pollution was abated upon one of the unsatisfactory properties, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

10. Blooming Valley Borough, Crawford County, does not have a public water works system. The water supply is taken from individual wells and springs.

11. Bolivar Borough, Westmoreland County, is supplied with water in emergency by the Mace Springs Water Company, from Bear Pond Run. One of the properties on the watershed was inspected and found to be in an unsatisfactory condition, remaining unchanged at the close of the year.

12. Cambridge Springs Borough, Crawford County, is supplied with water from French Creek. Three hundred and twenty-four of the properties on the watershed were inspected and reinspected and all but forty-nine were found to be in an unsatisfactory condition. Twenty-six pollutions were abated upon thirty-seven of the unsatisfactory properties, leaving twelve properties on the watershed in an unsatisfactory condition at the close of the year.

13. Canonsburg Borough, Washington County, is supplied with water by the North Strabane Water Company from Little Chartiers Creek. One camp on the watershed was inspected and found to be in an unsatisfactory condition. Two pollutions in the unsatisfactory camp were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

14. Canton Borough, Bradford County, is supplied with water by the Citizens Water Company from Mill Creek and Lake Nephawin. Six unsatisfactory properties on the watersheds were reinspected and seven pollutions upon five of the unsatisfactory properties were abated, leaving one property on the watersheds in an unsatisfactory condition at the close of the year.

15. Catasauqua Borough, Lehigh County, is supplied with water by the Clear Springs Water Company from Spring Creek. The sixty-nine properties on the watershed were inspected and all but sixteen were found to be in a satisfactory condition. Thirteen pollutions were abated upon eight of the unsatisfactory properties leaving eight properties on the watershed in an unsatisfactory condition at the close of the year.

16. Claysville Borough, Washington County, is supplied with water from a spring run. The four properties on the watershed were inspected and all but one were found to be in a satisfactory condition. Three pollutions were abated upon the one unsatisfactory property, leaving all the properties on the watershed in a satisfactory condition at the close of the year.

17. Coatesville Borough, Chester County, is supplied with water from Sucker and Heffner Runs. The one hundred and forty-nine properties on the watersheds were inspected, and all but forty-five were found to be in a satisfactory condition. Forty-three pollutions were abated upon thirty-one of the unsatisfactory properties, leaving fourteen properties on the watersheds in an unsatisfactory condition at the close of the year.

18. College Hill Borough, Beaver County, is supplied with filtered water by the College Hill Borough Water Company (Beaver Water Company's Eastvale Plant) from Beaver River.

19. Connellsville Borough, Somerset County, is supplied with water by the Connellsville Water Company from the Youghiogheny River and Laurel, Breakneck and Mount's Runs. Four thousand, two hundred and sixty-one of the properties on the watersheds were inspected and all but five hundred and sixty-two were found to be in a satisfactory condition. Five hundred and fourteen pollutions were abated upon three hundred and forty-seven of the unsatisfactory properties, leaving two hundred and fifteen unsatisfactory properties on the watersheds at the close of the year.

20. Cooperstown Borough, Venango County, does not have a public water works system, the supply being taken from individual wells and springs.

21.—Dauphin Borough, Dauphin County, is supplied with water by the Dauphin Consolidated Water Company from Stony Creek. Twelve unsatisfactory properties on the watershed were reinspected, and twenty-eight pollutions were abated upon eleven of the unsatisfactory properties, leaving one unsatisfactory property on the watershed at the close of the year.

22. Derry Borough, Westmoreland County, is supplied with water by the Derry Water Company from McGee, Edith, and Trout Runs and Ethel Springs. Nineteen of the properties on the watersheds were inspected and all but nine were found to be in a satisfactory condition. Eight pollutions upon eight of the unsatisfactory properties were abated, leaving one unsatisfactory property on the watersheds at the close of the year.

23. Downingtown Borough, Chester County, is supplied with water from the East Branch of Brandywine Creek. Three unsatisfactory properties on the water-

shed were reinspected and one pollutions upon one of the unsatisfactory properties was abated, leaving two properties on the watershed in an unsatisfactory condition at the close of the year. One of the unsatisfactory properties was referred to the Department's Attorneys for final adjustment. There is also an emergency supply taken from the East Brandywine Creek. Two unsatisfactory properties on this watershed were reinspected and two pollutions were abated upon one of the unsatisfactory properties, leaving one property in an unsatisfactory condition at the close of the year. The one unsatisfactory property was referred to the Department's Attorneys for final adjustment.

24. Dubois Borough, Clearfield County, is supplied with water from Muz and Anderson Runs. Six unsatisfactory properties on the watersheds were reinspected and remained unchanged at the close of the year.

25. Dushore Borough, Sullivan County, is supplied with water by the Dushore Water Company from Penn Run. The two properties on the watershed were inspected and found to be in an unsatisfactory condition. Two pollutions upon one of the unsatisfactory properties were abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

26. East Berlin Borough, Adams County, is supplied with water from Conewago Creek. Eight unsatisfactory properties on the watershed were reinspected and seven pollutions were abated upon seven properties, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

27. East Conemaugh Borough, Cambria County, is supplied with water by the Conemaugh and Franklin Water Company from Clapboard Run. Five unsatisfactory properties on the watershed were reinspected and three pollutions upon three of the unsatisfactory properties were abated, leaving two properties in an unsatisfactory condition on the watershed at the close of the year.

28. Edinboro Borough, Erie County, is supplied with water from Conneaut Lake. Two of the properties on the watershed were inspected and found to be in an unsatisfactory condition, remaining unchanged at the close of the year.

29. Elizabethville Borough, Dauphin County, is supplied with water by the Elizabethville Water Company from two spring streams, also from individual wells and springs. The watersheds are uninhabited.

30. Factoryville Borough, Wyoming County, is supplied with water by the Nokomis Water Company from Lake Sheridan and Baylor's Pond. Three unsatisfactory properties on the watershed were reinspected and one pollution upon one of the unsatisfactory properties was abated. The three properties remained in an unsatisfactory condition at the close of the year.

31. Falls Creek Borough, Jefferson County, is supplied with water from Falls Creek and Kyle Run. The ninety-eight properties on the watersheds were inspected and all but sixteen were found to be in a satisfactory condition. Twenty-four pollutions were abated upon the sixteen unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

32. Felton Borough, York County, does not have a public water works system. The water supply is taken from individual wells and springs.

33. Flemington Borough, Clinton County, is supplied with water by the West End Water Company from tributaries to Queen Run. One unsatisfactory property on the watersheds was reinspected and one pollution upon the unsatisfactory property abated, leaving all properties on the watersheds in a satisfactory condition at the close of the year.

34. Franklin Borough, Cambria County, is supplied with water by the Conemaugh and Franklin Water Company from Clapboard Run, described under the supply of East Conemaugh Borough.

35. Friendsville Borough, Susquehanna County, does not have a public water works system. The water supply is taken from individual wells and springs.

36. Gallitzin Borough, Cambria County, is supplied with water by the Cambria County Water Supply Company from Lynch Run. One unsatisfactory property on the watershed was reinspected and three pollutions upon the one unsatisfactory property was abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

37. Garrett Borough, Somerset County, is supplied with water by the Garrett Water Company from Bixie and Pine Runs. The thirty-four properties on the watersheds were inspected and all but ten were found to be in a satisfactory condition. Sixteen pollutions were abated upon ten unsatisfactory properties leaving all properties on the watersheds in a satisfactory condition at the close of the year.

38. Geneva Borough, Crawford County, does not have a public water works system. The water supply is taken from individual wells and springs.

39. Greenville Borough, Mercer County, is supplied with water by the Greenville Water Company from a tributary to the Shenango River. Two unsatisfactory properties on the watershed were reinspected and three pollutions upon one unsatisfactory property were abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

40. Hanover Borough, York County, is supplied with water by the Hanover and McSherrystown Water Company from Furnace Creek. The one hundred and thirty-eight properties on the watersheds were inspected and all but eight were

found to be in a satisfactory condition. Fifteen pollutions were abated upon the eight unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

41. Hummelstown Borough, Dauphin County, is supplied with water by the Hummelstown Consolidated Water Company from Swatara Creek. Thirteen unsatisfactory properties on the watershed were reinspected and six pollutions upon five of the unsatisfactory properties were abated, leaving twelve properties on the watershed in an unsatisfactory condition at the close of the year.

42. Jenkintown Borough, Montgomery County, is supplied with water by the Moreland Springs Water Company from Pennypack Creek. Two hundred and twenty-nine of the properties on the watershed were inspected and all but one hundred and seventeen were found to be in a satisfactory condition. Ninety-five pollutions were abated upon fifty-six of the unsatisfactory properties, leaving sixty-one properties on the watershed in an unsatisfactory condition at the close of the year. Two of the unsatisfactory properties were referred to the Department's Attorneys for final adjustment.

43. Jermyn Borough, Lackawanna County, is supplied with water by the Scranton Gas & Water Company from Rush Brook. One unsatisfactory property on the watershed was reinspected and one pollution upon the unsatisfactory property was abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

44. Jersey Shore Borough, Lycoming County, is supplied with water by the Jersey Shore Water Company from Larry's Creek. Three unsatisfactory properties on the watershed were reinspected and four pollutions upon two of the unsatisfactory properties were abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year. Pine Creek is used as an emergency supply. Seventy-six unsatisfactory properties on the watershed were reinspected and ninety-one pollutions upon forty-two of the unsatisfactory properties were abated, leaving thirty-four properties on the watershed in an unsatisfactory condition at the close of the year.

45. Johnsonburg Borough, Elk County, is supplied with water by the Johnsonburg Water Company from Powers Run and Silver Creek. The twelve properties on the watershed of Powers Run were inspected and all but seven were found to be in a satisfactory condition. Five pollutions were abated upon two of the unsatisfactory properties, leaving six properties on the watershed in an unsatisfactory conditions at the close of the year. The watershed of Silver Creek is uninhabited.

46. Kennett Borough, Chester County, is supplied with water from Red Clay Creek. One unsatisfactory property on the watershed was reinspected and remained unchanged at the close of the year.

47. Kutztown Borough, Berks County, is supplied with water by the Kutztown Water Company from Kemp's Run. The thirteen properties on the watershed were inspected and all but two were found to be in a satisfactory condition. Two pollutions upon one unsatisfactory property were abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

48. Laceyville Borough, Wyoming County, is supplied with water from springs and Little Tuscarora Creek. The thirty-four properties on the watershed were inspected and all but one were found to be in a satisfactory condition. Two pollutions upon the one unsatisfactory property were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

49. Latrobe Borough, Westmoreland County, is supplied with water by the Latrobe Water Company from Loyalhanna Creek. Twelve unsatisfactory properties on the watershed were reinspected and eight pollutions upon seven of the unsatisfactory properties were abated, leaving five properties on the watershed in an unsatisfactory condition at the close of the year.

50. Leechburg Borough, Armstrong County, is supplied with water by the Apollo Water Company from Beaver Run described under the supply of Apollo Borough.

51. Lilly Borough, Cambria County, is supplied with water by the Summit Water Company from Bear Rock Creek. Five of the properties on the watershed were inspected and four of them were found to be in an unsatisfactory condition, remaining unchanged at the close of the year.

52. Manheim Borough, Lancaster County, is supplied with water by the Manheim Water Company from Reiff's Run. The seventy-eight properties on the watershed were inspected and all but five were found to be in a satisfactory condition. Twelve pollutions were abated upon the five unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

53. Mansfield Borough, Tioga County, is supplied with water by the Mansfield Water Company from Lamb's Creek. Nine unsatisfactory properties on the watershed were reinspected and six pollutions were abated upon four of the unsatisfactory properties, leaving five properties in an unsatisfactory condition at the close of the year.

54. Marianna Borough, Washington County, is supplied with water by the Marianna Water Company from the North Fork of Ten Mile Creek. Twelve unsatis-

factory properties on the watershed were reinspected and twenty-two pollutions were abated upon ten of the unsatisfactory properties, leaving two properties on the watershed in an unsatisfactory condition at the close of the year.

55. McSherrystown Borough, Adams County, is supplied with water by the Hanover and McSherrystown Water Company from Furnace Creek reported under the supply of Hanover Borough.

56. Mechanicsburg Borough, Cumberland County, is supplied with water by the Riverton Consolidated Water Company from Yellow Breeches Creek. Eleven of the properties on the watershed were inspected and eight of them were found to be in an unsatisfactory condition. Sixteen pollutions were abated upon seven of the unsatisfactory properties, leaving one property on the watershed in an unsatisfactory condition at the close of the year.

57. Meyersdale Borough, Somerset County, is supplied with water by the Sand Spring Water Company from Stamm Run, Blue Lick Creek, and Sand Spring. Nine of the properties on the watersheds were inspected and all but four were found to be in a satisfactory condition. The four unsatisfactory properties remained unchanged at the close of the year.

58. Middletown Borough, Dauphin County, is supplied with water by the Middletown and Swatara Consolidated Water Company from Swatara Creek. Thirteen unsatisfactory properties on the watershed were reinspected and six pollutions were abated upon five of the unsatisfactory properties, leaving twelve properties on the watershed in an unsatisfactory condition at the close of the year.

59. Mill Hall Borough, Clinton County, is supplied with water by the Crystal Pure Water Company from Queen's Run. One unsatisfactory property on the watershed was reinspected and one pollution upon this property was abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

60. Montgomery Borough, Lycoming County, is supplied with water by the Montgomery Water Company from Black Hole Run. Two unsatisfactory properties on the watershed were inspected and remained unchanged at the close of the year.

61. Mount Penn Borough, Berks County, is supplied with water by the Mount Penn Suburban Water Company from a spring run. Six properties on the watershed were inspected and all but one were found to be in a satisfactory condition. One pollution upon the one unsatisfactory property was abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

62. Muncy Borough, Lycoming County, is supplied with water by the Muncy Water Supply Company from Glade Run. Four unsatisfactory properties on the watershed were reinspected and six pollutions upon the four unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

63. New Bethlehem Borough, Clarion County, is supplied with water by the Citizens Water Company from Red Bank and Sandly Lick Creeks. Seventy-five unsatisfactory properties on the watersheds were reinspected and fourteen pollutions upon nine unsatisfactory properties were abated, leaving sixty-six properties on the watersheds in an unsatisfactory condition at the close of the year.

64. Nicholson Borough, Wyoming County is supplied with water by the Nicholson Water Company from Hortons Creek. The one hundred and fifty-six properties on the watershed were inspected and all but eight of them were found to be in a satisfactory condition. Five pollutions were abated upon four of the unsatisfactory properties, leaving four properties on the watershed in an unsatisfactory condition at the close of the year. There is also an emergency intake in Tunkhannock Creek. Two unsatisfactory properties on this watershed were inspected and four pollutions on the two unsatisfactory properties were abated.

65. North East Borough, Erie County, is supplied with water from Sixteen Mile Creek. The seven properties on the watershed were inspected and five of them were found to be in an unsatisfactory condition. Eleven pollutions were abated upon the five unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year. There is also an emergency intake in Sixteen Mile Creek. The fifty-six properties on the watershed were inspected and all but eight were found to be in a satisfactory condition. Ten pollutions were abated upon the eight unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

66. Orrstown Borough, Franklin County does not have a public water works system. The water supply is taken from individual wells and springs.

67. Oxford Borough, Chester County is supplied with water from drilled wells.

68. Palmerton Borough, Carbon County, is supplied with water by the Palmer Water Company from Pohopoco Creek. Six unsatisfactory properties on the watershed were reinspected. Four pollutions were abated upon one of the unsatisfactory properties, leaving five properties on the watershed in an unsatisfactory condition at the close of the year.

69. Patton Borough, Cambria County, is supplied with water by the Patton Water Company from Chest Creek. Three unsatisfactory properties on the watershed were reinspected and nine pollutions were abated upon three unsatisfactory properties, leaving one property in an unsatisfactory condition at the close of the year.

70. Portage Borough, Cambria County, is supplied with water by the Martindale Water Company from Trout Run. The eight properties on the watershed were inspected and all but two were found to be in a satisfactory condition. The two unsatisfactory properties on the watershed remained unchanged at the close of the year.

71. Port Allegany Borough, McKean County, is supplied with water by the Port Allegany Water Company from Skinner Creek. The three unsatisfactory camps on the watershed were inspected and ten pollutions were abated in the three unsatisfactory camps, leaving two of them in an unsatisfactory condition at the close of the year.

72. Punxsutawney Borough, Jefferson County, is supplied with water by the Punxsutawney Water Company from East Mahoning Creek and Clover Run. Five unsatisfactory properties on the watersheds were reinspected and seven pollutions upon the five unsatisfactory properties were abated, leaving all properties on the watersheds in a satisfactory condition at the close of the year.

73. Quakertown Borough, Bucks County, is supplied with water by the Quakertown Water Company from Tohickon Creek and driven wells. The two hundred and thirty-three properties on the watershed were inspected and all but twenty-one were found to be in a satisfactory condition. Thirty pollutions were abated upon twelve of the unsatisfactory properties, leaving nine properties on the watershed in an unsatisfactory condition at the close of the year.

74. Renovo Borough, Clinton County, is supplied with water from Drury and Paddy's Runs. The twenty-two properties on the watersheds were inspected and all but seven were found to be in a satisfactory condition. Seven pollutions were abated upon three of the unsatisfactory properties, leaving five properties on the watersheds in an unsatisfactory condition at the close of the year.

75. Royalton Borough, Dauphin County, is supplied with water by the Middletown and Swatara Consolidated Water Company from Swatara Creek, described under the supply of Middletown Borough.

76. Scalp Level Borough, Cambria County, is supplied with water by the Richland Township Water Company from Little Paint Creek. Twenty-two unsatisfactory properties on the watershed were reinspected and twenty-eight pollutions were abated upon nineteen of the unsatisfactory properties, leaving three properties on the watershed in an unsatisfactory condition at the close of the year. Two unsatisfactory properties were referred to the Department's Attorneys for final adjustment.

77. Scottdale Borough, Westmoreland County, is supplied with water by the Mountain Water Supply Company from Spruce Run, Green Lick, and Indian Creeks. Forty-nine of the properties on the watersheds were inspected and six of them were found to be in an unsatisfactory condition. Three pollutions were abated upon three of the unsatisfactory properties, leaving three properties on the watersheds in an unsatisfactory condition at the close of the year.

78. Selinsgrove Borough, Snyder County, is supplied with water by the Selinsgrove Water Supply Company from Penns Creek. Thirty-eight unsatisfactory properties on the watershed were reinspected and thirty-nine pollutions were abated upon twenty unsatisfactory properties, leaving eighteen properties on the watershed in an unsatisfactory condition at the close of the year.

79. Sellersville Borough, Bucks County, is supplied with water from drilled wells and springs. Nine properties on the drainage area were inspected and found to be in a satisfactory condition.

80. South Fork Borough, Cambria County, is supplied with water by the South Fork Water Company from Sandy Run. Thirteen of the properties on the watershed were inspected and twelve of them were found to be in an unsatisfactory condition. Eleven pollutions were abated upon seven of the unsatisfactory properties leaving five properties on the watershed in an unsatisfactory condition at the close of the year.

81. Spangler Borough, Cambria County, is supplied with water by the Northern Cambria Water Company from Brown's Run, described under the supply of Barnesboro Borough.

82. Summer Hill Borough, Cambria County, is supplied with water by the Cambria County Water Supply Company from Pringle and Laurel Runs. The forty-one properties on the watersheds were inspected and all but five were found to be in a satisfactory condition. Five pollutions were abated upon the five unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

83. Troy Borough, Bradford County, is supplied with water from drilled wells and the West Branch of Sugar Run. Three unsatisfactory properties on the watershed were reinspected and three pollutions upon two of the unsatisfactory properties were abated, leaving one property on the watershed in an unsatisfactory condition at the close of the year. One unsatisfactory property was referred to the Department's Attorneys for final adjustment.

84. Tunnelhill Borough, Cambria County, is supplied with water by the Cambria County Water Supply Company from Lynch Run described under the supply for Gallitzin Borough.

85. Union City Borough, Erie County, is supplied with water from Bentley, Lime Kiln, and Brunstetter Runs. One unsatisfactory property on the watersheds

was reinspected and two pollutions upon the one unsatisfactory were abated, leaving all properties on the watersheds in a satisfactory condition at the close of the year.

86. Utica Borough, Venango County, does not have a public water works system. The water supply is taken from individual wells and springs.

87. Vintondale Borough, Cambria County, is supplied with water by the Jackson Township Water Company from Bracken and Shuman Runs. Three unsatisfactory properties on the watersheds were reinspected and five pollutions were abated upon the three unsatisfactory properties, leaving one property in an unsatisfactory condition at the close of the year. There is also an auxiliary supply furnished by the Black Lick Water Company from Black Lick Creek. Nine unsatisfactory properties on the watershed were reinspected and twelve pollutions upon eight unsatisfactory properties were abated, leaving one property unchanged at the close of the year.

88. Waymart Borough, Wayne County, is supplied with water by the Waymart Water Company from Vanauken Creek. One unsatisfactory property on the watershed was reinspected and four pollutions upon the one unsatisfactory property were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

89. Waynesboro Borough, Franklin County, is supplied with water by the Waynesboro Water Company from springs and the East Branch of Little Antietam Creek. The thirty-seven properties on the watershed were inspected and found to be in a satisfactory condition. The drainage area of the springs is uninhabited.

90. West Conshohocken Borough, Montgomery County, is supplied with water by the West Conshocken Water Company from Queen Valley Creek. Three unsatisfactory properties on the watershed were reinspected and three pollutions were abated upon one unsatisfactory property, leaving two properties on the watershed in an unsatisfactory condition at the close of the year.

91. West Reading Borough, Berks County, is supplied with filtered water from the Schuylkill River by the West Reading Water Company.

92. Windber Borough, Cambria County, is supplied with water by the Windber Water and Power Company from Clear Shade Creek. Thirteen unsatisfactory properties on the watershed were reinspected and thirteen pollutions were abated upon eleven of the unsatisfactory properties, leaving two properties on the watershed in an unsatisfactory condition at the close of the year. The Richland Township Water Company also, supplies water to Windber Borough from Little Paint Creek, described under the supply of Scalp Level Borough. There is also an emergency supply furnished by the Paint Township Water Company from Paint Creek. Fifty-five unsatisfactory properties on the watershed were reinspected and fourteen pollutions were abated upon eight of the unsatisfactory properties, leaving fifty properties on the watershed in an unsatisfactory condition at the close of the year.

93. Woodcock Borough, Crawford County, does not have a public waterworks system. The water supply is taken from individual wells and springs.

94. Wyalusing Borough, Bradford County, is supplied with water by the Wyalusing Water Company from Stalford Brook. Eight unsatisfactory properties on the watershed were reinspected and seventeen pollutions were abated upon six of the unsatisfactory properties, leaving two properties on the watershed in an unsatisfactory condition at the close of the year.

The *twenty-five villages* whose water supplies were inspected or reinspected are as follows:—

1. Baggaley Village, Unity Township, Westmoreland County, is supplied with water by the H. C. Frick Coke Company from Wolf Spring Run. The eleven properties on the watershed were inspected and all but three were found to be in a satisfactory condition. Two pollutions were abated upon one of the unsatisfactory properties, leaving two properties on the watershed in an unsatisfactory condition at the close of the year.

2. Beaverdale Village, Adams Township, Cambria County, is supplied with water by the Summit Water Company from Beaverdam Run. The six properties on the watershed were inspected four of which were found to be in an unsatisfactory condition, remaining unchanged at the close of the year.

3. Berwindino Village, Shade Township, Somerset County, is supplied with water by the Windber Water and Power Company from Shade Creek. The five properties on the watershed were inspected and three of them were found to be in an unsatisfactory condition. Three pollutions were abated upon the three unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

4. Boyer Heights Village, Cumru Township, Berks County, is supplied with water by the Angelica Water Company from Angelica Creek. The three hundred and thirty-three properties on the watershed were inspected and all but twenty-nine were found to be in a satisfactory condition. Thirty-one pollutions were abated upon fifteen of the unsatisfactory properties, leaving fourteen properties on the watershed in an unsatisfactory condition at the close of the year. Two of the unsatisfactory properties were referred to the Department's Attorneys for final adjustment.

5. Brookside Village, Cumru Township, Berks County, is supplied with water by the Angelica Water Company from Angelica Creek described under the supply for Boyer Heights Village.

6. Cairnbrook Village, Shade Township, Somerset County, proposes to take water through the Cairnbrook Water Company from Beaver Run. The thirty-one properties on the watershed were inspected and all but ten were found to be in a satisfactory condition. Eight pollutions were abated upon seven of the unsatisfactory properties, leaving three properties on the watershed in an unsatisfactory condition at the close of the year.

7. Crabtree Village, Unity Township, Westmoreland County, is supplied with water by the Jamison Coal and Coke Company from Little Crabtree Run. Sixty-five properties on the watershed were inspected and all but twenty-seven of them were found to be in a satisfactory condition. Twenty-six pollutions were abated upon twenty-two of the unsatisfactory properties, leaving five properties on the watershed in an unsatisfactory condition at the close of the year.

8. Donnelly Village, East Huntingdon Township, Westmoreland County, is supplied with water by the H. C. Frick Coke Company from Leighty Hollow Run. The thirteen properties on the watershed were inspected and all but five of them were found to be in a satisfactory condition. Five pollutions were abated upon the five unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

9. Ehrenfeld Village, Croyle Township, Cambria County, is supplied with water by the Cambria County Water Supply Company from Pringle and Laurel Runs. Described under the supply of Summerhill Borough.

10. Forbes Road Village, Salem Township, Westmoreland County, is supplied with water by the Jamison Coal and Coke Company from Little Crabtree Run, described under the supply of Crabtree Village.

11. Hannastown Village, Hempfield Township, Westmoreland County, is supplied with water by the Jamison Coal & Coke Company from Little Crabtree Run, described under the supply of Crabtree Village.

12. Leroy Village, Leroy Township, Bradford County, is supplied with water by two private Water Companies from Golf Brook and springs. The two properties on the watershed were inspected and found to be in a satisfactory condition.

13. Little Italy Village, Mauch Chunk Township, Carbon County, is supplied with water by the Panther Creek Water Company from springs. The drainage area is uninhabited.

14. Luxor Village, Hempfield Township, Westmoreland County, is supplied with water by the Jamison Coal & Coke Company from Little Crabtree Run, described under the supply for Crabtree Village.

15. Mar-Lin Village, Norwegian Township, Schuylkill County, proposes to take water from the Raccoon Creek (Mar-Lin Water Company.) The thirty-eight properties on the watershed were inspected and all but eleven of them were found to be in a satisfactory condition. Six pollutions were abated upon one unsatisfactory property, leaving ten properties on the watershed in an unsatisfactory condition at the close of the year.

16. Mayfield Village, East Huntingdon Township, Westmoreland County, is supplied with water by the H. C. Frick Coke Company from Leighty Hollow Run, described under the supply for Donnelly Village.

17. Millmont Village, Cumru Township, Berks County, is supplied with water by the Angelica Water Company from Angelica Creek, described under the supply for Boyer Heights Village.

18. Oakbrook Village, Cumru Township, Berks County, is supplied with water by the Angelica Water Company from Angelica Creek, described under the supply for Boyer Heights Village.

19. Oakland Village, Cumru Township, Berks County, is supplied with water by the Angelica Water Company from Angelica Creek, described under the supply for Boyer Heights Village.

20. Rauchtown Village, Crawford Township, Clinton County, is supplied with water from Rauch Creek. The fifty-seven properties on the watershed were inspected and all but seven of them were found to be in a satisfactory condition. The seven unsatisfactory properties remained unchanged at the close of the year.

21. Robertsdale Village, Wood Township, Huntingdon County, is supplied with water by the Rockhill Iron & Coal Company from Trout Creek. The four properties on the watershed were inspected and two of them were found to be in an unsatisfactory condition. Four pollutions were abated upon the two unsatisfactory properties, leaving all properties on the watershed in a satisfactory condition at the close of the year.

22. Simpson Village, Fell Township, Lackawanna County, is supplied with water by the Belmont Water Company from a spring run. One unsatisfactory property on the watershed was reinspected and one pollution removed, leaving all properties on the watershed in a satisfactory condition at the close of the year.

23. Wehrum Village, Buffington Township, Indiana County, is supplied with water by the East Wheatfield and Buffington Township Water Company from Rummells Run. The nineteen properties upon the watershed were inspected and thirteen of them were found to be in an unsatisfactory condition. Eleven pollutions were abated upon nine unsatisfactory properties, leaving five properties in an unsatisfactory condition at the close of the year.

24. Whitney Village, Unity Township, Westmoreland County, is supplied with water by the H. C. Frick Coke Company from Ridge Run. The four properties on the watershed were inspected and all but one of them were found to be in a satisfactory condition. The unsatisfactory property remained unchanged at the close of the year.
25. Woodvale Village, Broadtop Township, Bedford County, is supplied with water by the Rockhill Iron and Coal Company from Trout Run, described under the supply for Robertsdale Village.

The *five industrial water supplies* which were inspected or reinspected are as follows:

1. The Buffalo, Rochester & Pittsburgh Railway Company, has a supply of water from Kyle Run. The thirty-eight properties on the watershed were inspected and found to be in a satisfactory condition. The intake dam is located in Washington Township, Jefferson County, above Falls Creek.
2. The Pennsylvania Railroad Shops and trains at Altoona are supplied with water from Pottsgrove Run. The one camp on the watershed was inspected and found to be in an unsatisfactory condition. One pollution in the unsatisfactory camp was abated, leaving the watershed in a satisfactory condition at the close of the year.
3. The Lehigh Coal & Navigation Company supplies water to its collieries at Hauto, Mauch Chunk Township, Carbon County, from Nesquehoning Creek. The four properties on the watershed were inspected and found to be in a satisfactory condition.
4. The Pennsylvania Railroad Company Shops at Renovo, Clinton County, are supplied with water from Drury and Paddy's Runs, described under the supply for Renovo Borough.
5. The Strickler Mines, Mount Pleasant Township, Westmoreland County, are supplied with water by the Mt. Pleasant Coke Company from Township Line Run. Sixteen unsatisfactory properties on the watershed were reinspected and twelve pollutions upon six of the unsatisfactory properties were abated, leaving ten properties on the watershed in an unsatisfactory condition at the close of the year.

The *two State Institutions* whose water supplies were inspected or reinspected are as follows:—

1. The Pennsylvania State Sanatorium for Tuberculosis No. 2 at Cresson, Cambria County, is partly supplied with water from Bear Rock Springs. Eight unsatisfactory properties on the drainage area were reinspected and ten pollutions were abated upon seven of the unsatisfactory properties, leaving one property in an unsatisfactory condition at the close of the year.
2. The Pennsylvania Training School at Morganza, Cecil Township, Washington County, is supplied with water from a tributary to Chartiers Creek. Two unsatisfactory properties on the watershed were reinspected and two pollutions upon the two unsatisfactory properties were abated, leaving all properties on the watershed in a satisfactory condition at the close of the year.

The *County Home* whose water supply was inspected is:

1. The Washington County Home in South Strabane Township, Washington County, is supplied with water from a tributary to Little Chartiers Creek. The one hundred and thirty-seven properties on the watershed were inspected and all but sixty of them were found to be in a satisfactory condition. Seventeen pollutions were abated upon eight of the unsatisfactory properties, leaving fifty-two properties on the watershed in an unsatisfactory condition at the close of the year.

THE FOLLOWING IS A LIST OF WATER COMPANIES AND MUNICIPALITIES MAINTAINING A REGULAR PATROL OF THE WATERSHED ABOVE THEIR WATER WORKS INTAKES IN COMPLIANCE WITH THE PERMITS ISSUED BY THE STATE DEPARTMENT OF HEALTH.

Albion Borough, Erie County.
Bath Borough, Northampton County
Berwick Water Company, Berwick Borough, Columbia County.
Bloomfield Water & Sewer Company, New Bloomfield Borough, Perry County.
Citizens Water Company, Canton Borough, Bradford County.
Clearfield Water Company, Clearfield Borough, Clearfield County.
Dauphin Consolidated Water Company, Dauphin Borough, Dauphin County.
Dingmans Ferry Water Company, Dingmans Ferry Village, Pike County.
Doylestown Borough, Bucks County.
DuBois Borough, Clearfield County.
East McKeesport Water Company, East McKeesport Borough, Allegheny County.
Edinboro Borough, Erie County.
Mountain Water Company of Emaus, Emaus Borough, Lehigh County.
Falls Creek Borough, Jefferson County.
Girard Water Company, West Mahanoy Township, Schuylkill County.
Glen Mills Schools (Girls Department) Middletown Township, Delaware County
Hallstead Water Company, Hallstead Borough, Susquehanna County.
Haysville Water Company, Haysville and Osborne Boroughs, Allegheny County.
Heidelberg Water Company, Heidelberg Township, Lebanon County.
Hellam Water Company, Hallam Borough, York County.
Hopbottom Water Company, Hopbottom Borough, Susquehanna County.
Huntingdon Water Supply Company, Huntingdon Borough, Huntingdon County
Jacks Mountain Water Company, Mapleton Borough, Huntingdon County.
Jersey Shore Water Company, Jersey Shore Borough, Lycoming County.
Johnsonburg Water Company, Johnsonburg Borough, Elk County.
Johnstown Water Company, Johnstown City, Cambria County.
Koppel Water Company, Koppel Village, Beaver County.
Lebanon City, Lebanon County.
Ligonier Borough, Westmoreland County.
Lykens Water Company, Lykens Borough, Dauphin County.
Marie Water Company, Expedit Village, Cambria County.
Marietta Gravity Water Company, Marietta Borough, Lancaster County.
Martindale Water Company, Portage Borough, Cambria County.
Marysville Water Company, Marysville Borough, Perry County.
Mauch Chunk Water Company, Mauch Chunk Borough, Carbon County.
Moreland Spring Water Company, Jenkintown Borough and Moreland Township, Montgomery County.
Morrellville and Cambria Borough Water Company, Johnstown City, Cambria County.
Mt. Penn Suburban Water Company, Mt. Penn Borough, Berks County.
Mountville Borough, Lancaster County.
Muncy Water Supply Company, Muncy Borough, Lycoming County.
North East Borough, Erie County.
North Strabane Water Company, Canonsburg Borough, Washington County.
Pennsylvania Reform School, Morganza, Cecil Township, Washington County.
Pennsburg Water Company, Pennsburg Borough, Montgomery County.
Port Allegany Water Company, Port Allegany Borough, McKean County.
Portland Water Company, Portland Borough, Northampton County.
Punxsutawney Water Company, Punxsutawney Borough, Jefferson County.
Red Hill Water Company, Red Hill Borough, Montgomery County.
Reynoldsville Borough, Jefferson County.
Roaring Creek Water Company, Shamokin Borough, Northumberland County.
Roulette Water Company, Roulette Village, Potter County.
Scranton Gas & Water Company, Scranton City, Lackawanna County.
Sellersville Borough, Bucks County.
Sheffield Water Company, Sheffield Village, Warren County.
South Fork Water Company, South Fork Borough, Cambria County.
Springfield Water Company, Philadelphia Suburbs.
Stroudsburg Water Supply Company, Stroudsburg Borough, Monroe County.
Towanda Water Works Company, Towanda Borough, Bradford County.
Tremont Water & Gas Company, Tremont Borough, Schuylkill County.
Trout Run Water Company, Duncannon Borough, Perry County.
Uniontown Water Company, Uniontown Borough, Fayette County.
Upper Mauch Chunk Water Company, Mauch Chunk Borough, Carbon County.
Warren Water Company, Warren Borough, Warren County.
Washington Water Supply Company, Washington Township, Lehigh County.
West Conshohocken Water Company, West Conshohocken Borough, Montgomery County.

Windber Water & Power Company, Windber Borough, Cambria County.
Wyalusing Water Company, Wyalusing Borough, Bradford County.
Wyoming Water Supply Company, Hazelton City, Luzerne County.

THE FOLLOWING REPORT THE WATERSHED FROM WHICH THEY OBTAIN THEIR WATER SUPPLY TO BE UNINHABITED.

Bradford City, McKean County.
Citizens Water Company, Gordon Borough, Schuylkill County.
Nant-y-Glo Water Company, Nant-y-Glo Village, Cambria County.
Northumberland Water Company, Northumberland Borough, Northumberland County.
Orbisonia Water Company, Orbisonia Borough, Huntingdon County.
Parkesburg Water Company, Parkesburg Borough, Chester County.
Silver Creek Water Company, Blythe Township, Schuylkill County.

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15. GENERAL SANITATION.

Some industrial pollutions cannot be classed as sewage pollutions under the law. They may bring about a very unsanitary condition in a natural water course, requiring to be abated on the score of a common nuisance.

Pollution of the ground water supply by sewage from a village or town or any other source is matter for investigation and action by the State Department of Health. The Commissioner of Health is charged with the preservation of the purity of such waters in the interest of public health. All such work done by field officers which has to deal with the disposal of sewage in villages, and towns comes more particularly under the work of municipal sanitation. In many villages and hamlets throughout the State general practices respecting disposal of household wastes are insanitary and possibly the cause of disease and mortality. These subjects are properly investigated by the Department of Health since there is no other body having jurisdiction in the fifteen hundred townships wherein reside about one-third of the population of the Commonwealth. This class of work is distinct from other field office work and is treated under the head of General Sanitation.

Within the city, borough, village, and township the remedy for the various nuisances in the streams, the pollution of public ground water supply, general unsanitary conditions respecting disposal of household wastes and causes of disease and mortality is found quite often to be a public sewerage system. Considerable time must be allowed naturally for discussion of the introduction of such an improvement and for the inauguration of a sewer system. Therefore, it is not reasonable to expect immediate abatements of these thousand of pollutions within the municipalities. However, the sanitary survey forms a basis upon which to make a beginning.

The following tables give a summary of sanitary surveys on certain watersheds and a summary of sanitary surveys in certain Boroughs, Villages, and Townships:

SUMMARY OF SANITARY SURVEY ON CERTAIN WATERSHEDS.

Minor Watersheds.	Occupied properties inspected and re-inspected.			Abatements.		
	Total.	Satisfactory.	Unsatisfactory.	Properties.	Pollutions.	Properties unsatisfactory.
Wissahickon Creek, Montgomery County,	710	571	139	15	20	124
Darby Creek, Delaware County,	42	0	42	19	65	23
Chester Creek, Delaware County,	53	0	53	22	64	31
Cobbs Creek, Delaware County,	16	0	16	6	14	10
Brandywine Creek, Delaware County,	3	0	3	1	1	2
Ridley Creek, Delaware County, below Media intake,	28	0	28	14	21	14
Crum Creek, Delaware County, below Springfield Water Company intake,	21	0	21	1	4	
Perkiomen Creek, Montgomery County,	870	769	101	28	41	33
Mahoning Creek, Jefferson, Indiana and Armstrong Counties,	43	0	43	11	20	32

SUMMARY OF SANITARY SURVEY ON CERTAIN WATERSHEDS—Continued.

Minor Watersheds.	Occupied properties inspected and re-inspected.			Abatements.		
	Total.	Satisfactory.	Unsatisfactory.	Properties.	Pollutions.	Properties unsatisfactory.
Brandywine Creek, Chester County,	27	0	27	3	5	24
Chester Creek, Chester County,	10	0	10	6	15	5
Ridley Creek, Chester County,	1	0	1	1	1	0
East Brandywine Creek, Chester County,	12	1	11	6	14	5
West Brandywine Creek, Chester County,	35	0	35	7	18	28
White Clay Creek, Chester County,	38	25	13	6	9	7
Pequea Creek, Chester County,	2	0	2	1	3	1
Red Clay Creek, Chester County,	102	72	30	9	20	21
Darby Creek, Chester County,	4	0	4	2	3	3
Lizard Creek, Schuylkill County,	3	0	3	1	2	3
Mahoning Creek, Carbon County,	4	0	4	2	9	2
Octorora Creek, Lancaster County,	4	0	4	1	4	3
Little Conestoga Creek, Lancaster County,	18	0	18	12	24	6
Big Conestoga Creek, Lancaster County,	38	0	38	2	4	36
Big Chiquesalunga Creek, Lancaster County,	16	0	16	4	9	12
Pequea Creek, Lancaster County,	18	0	18	9	24	9
Bushkill Creek, Northampton County,	7	0	7	4	5	3
Monocacy Creek, Northampton County,	7	0	7	2	5	5
Martins Creek, Northampton County,	16	0	16	6	16	10
Conewago Creek, Dauphin and Lebanon Counties,	4	0	4	4	6	0
Loyalhanna Creek, Westmoreland County, below Latrobe intake,	1,547	1,255	292	222	240	70
Cumberland, Jefferson & Monongahela Townships and Carmichael Borough, Greene County,	10	0	10	5	9	5
Fishing Creek, Centre and Clinton Counties,	90	0	90	44	68	46
Conewago Creek, Adams and York Counties, below East Berlin intake,	82	71	11	11	20	0
Gunpowder River, York County, draining to Maryland,	1	0	1	1	1	0
French Creek, Erie, Crawford and Venango Counties, below Cambridge Springs intake,	663	385	278	177	265	101
Oil Creek, Erie, Crawford and Venango Counties,	1,931	1,764	167	24	33	143
Tohickon Creek, Bucks County, below Quakertown intake,	7	0	7	0	0	7
Pennypack Creek, Montgomery County, below Moreland Spring Water Co. intake,	52	0	52	30	65	22
Cobbs Creek, Montgomery County,	1	0	1	0	0	1
Dyberry Creek, Wayne County, special,	1	0	1	0	0	1
Tunkhannock Creek, Susquehanna County,	908	860	48	8	15	40
Meshoppen Creek, Susquehanna County,	895	854	41	1	4	40
Wyalusing Creek, Bradford and Susquehanna County,	1,743	1,531	212	182	338	30
Towanda Creek, Sullivan, Tioga and Bradford Counties,	2,281	1,985	296	243	427	53
Conewango Creek, Warren County,	788	757	31	3	0	31
McMichaels Creek, Monroe County,	720	636	84	32	53	52
Bushkill Creek, Monroe County,	135	115	20	10	19	10
Marshall Creek, Monroe County,	243	220	23	12	25	11
Pocono Creek, Monroe County,	405	383	22	12	12	10
Broadhead Creek, Monroe County below Stroudsburg intake,	162	149	13	8	12	5
Cherry Creek, Monroe County,	188	153	35	16	27	19
Bushkill Creek, Pike County, special,	1	0	1	0	0	1
Bernhart Creek, Berks County below Reading intake,	64	62	2	0	0	2
Ranch Creek, Clinton County,	114	101	13	0	0	13
Loyalsock Creek, Bradford, Wyoming and Sullivan Counties,	2,863	2,609	254	68	99	186
Lycoming Creek, Lycoming, Tioga and Sullivan Counties,	1,895	1,692	203	145	279	58
Sugar Creek, Bradford and Tioga Counties,	1,707	1,486	221	200	292	25
Lake Erie, Erie County,	8	0	8	7	37	1
Sinnemahoning Creek, Potter County,	12	0	12	12	12	0
Poplar Run, Blair County,	6	0	6	5	9	1
Conococheague Creek, Adams County,	36	36	0	0	0	0
Muddy Creek, Adams County,	71	71	0	0	0	0
Rock Creek, Adams County,	1,669	1,564	105	87	135	18
Codorus Creek, York County, below York City intake,	180	0	180	91	168	89
Otter Creek, Mercer County, below Mercer intake,	1	0	1	1	2	0
Gulf Creek, Delaware County,	33	0	33	22	66	11
Raccoon Creek, Beaver County,	9	0	9	5	9	4
Furnace Creek, York County, below Hanover and Mc-Sherrystown Water Co. intake,	438	385	53	40	61	13
Spring Creek, Centre County,	1,646	1,347	299	251	325	48
Logan Branch Creek, Centre County,	360	320	40	32	104	8
Total,	26,121	22,129	3,892	2,209	3,789	1,690

SANITARY SURVEY IN CERTAIN BOROUGHS, SEVEN VILLAGES AND SIX TOWNSHIPS.

	Occupied properties inspected and re-inspected.			Abatements.		
	Total.	Satisfactory.	Unsatisfactory.	Properties.	Pollutions.	Properties unsatisfactory.
Ambler Borough, Montgomery County,	87	0	87	4	12	83
Atglen Borough, Chester County,	205	179	26	0	0	26
Avondale Borough, Chester County,	224	152	72	0	0	72
Bechtelsville Borough, Berks County,	11	0	11	8	17	3
Birdsboro Borough, Berks County,	12	0	12	4	8	8
Blooming Valley Borough, Crawford County,	55	51	4	1	2	3
Boyertown Borough, Berks County,	36	0	36	3	6	33
Bridgeport Borough, Montgomery County,	601	0	601	10	20	591
Burlington Borough, Bradford County,	66	60	6	4	10	2
Canonsburg Borough, Washington County, special,	2	0	2	2	3	0
Chambersburg Borough, Franklin County,	141	0	141	77	77	64
Coatesville Borough, Chester County,	5	0	5	3	3	2
College Hill Borough, Beaver County,	505	360	145	0	0	145
Conneaut Lake Borough, Crawford County,	140	128	12	0	0	12
Conshohocken Borough, Montgomery County,	1,270	0	1,270	193	198	1,177
Cooperstown Borough, Venango County,	92	85	7	7	14	0
Cross Roads Borough, York County,	51	51	0	0	0	0
Dale Borough, Cambria County, special,	1	0	1	1	1	0
Dauphin Borough, Dauphin County, special,	1	0	1	1	1	0
Dover Borough, York County,	255	214	41	37	90	4
Downingtown Borough, Chester County,	6	0	6	2	7	4
Duncannon Borough, Perry County, special,	3	0	3	0	0	3
Duncansville Borough, Blair County,	3	0	3	1	4	2
Dushore Borough, Sullivan County,	252	179	73	65	137	8
East Bangor Borough, Northampton County,	4	0	4	4	5	0
East Prospect Borough, York County,	95	94	1	1	2	0
Edinboro Borough, Erie County,	15	0	15	0	0	15
Elizabethville Borough, Dauphin County,	328	226	102	57	123	45
Everett Borough, Bedford County, special,	1	0	1	1	1	0
Fawn Grove Borough, York County,	94	94	0	0	0	0
Felton Borough, York County,	77	64	13	13	22	0
Finleyville Borough, Washington County, special,	1	0	1	1	2	0
Forksville Borough, Sullivan County,	57	47	10	0	0	10
Freeland Borough, Luzerne County, part.,	261	257	4	0	0	4
Freemansburg Borough, Northampton County,	3	0	3	3	5	0
Friendsville Borough, Susquehanna County,	43	43	0	0	0	0
Geneva Borough, Crawford County,	85	74	11	3	4	8
Gettysburg Borough, Adams County,	1,246	444	802	0	0	802
Glendon Borough, Northampton County,	3	0	3	1	1	2
Hallam Borough, York County,	140	139	1	1	1	0
Hellertown Borough, Northampton County,	13	0	13	1	3	13
Huntingdon Borough, Huntingdon County,	22	0	22	18	37	4
Jefferson Borough, Greene County,	5	0	5	3	4	2
Laporte Borough, Sullivan County,	83	77	6	0	0	6
Leraysville Borough, Bradford County,	134	93	41	17	35	24
Malvern Borough, Chester County,	2	0	2	1	2	1
Mars Borough, Butler County, special,	2	0	2	0	0	2
Mauch Chunk Borough, Carbon County, part.,	561	135	426	0	0	426
McConnellsburg Borough, Fulton County,	37	0	37	37	76	0
Monroe Borough, Bradford County,	149	149	0	0	0	0
Mt. Pleasant Borough, Westmoreland County, special,	2	0	2	0	0	2
Nazareth Borough, Northampton County,	67	0	67	48	63	19
New Albany Borough, Bradford County,	149	124	25	23	46	2
New Lebanon Borough, Mercer County,	5	0	5	5	6	0
New Paris Borough, Bedford County,	7	0	7	2	4	5
Norristown Borough, Montgomery County,	6	0	6	1	1	6
Northampton Borough, Northampton County,	18	0	18	12	23	6
Northampton Heights Borough, Northampton County,	2	0	2	2	24	0
North Wales Borough, Montgomery County,	207	0	207	0	0	207
Orwigsburg Borough, Schuylkill County,	482	357	125	14	40	111
Oxford Borough, Chester County, not including ice supply,	702	540	162	0	0	162
Parkesburg Borough, Chester County,	250	54	196	0	0	196
Perkasie Borough, Bucks County,	106	0	106	26	80	80

SANITARY SURVEY IN CERTAIN BOROUGHS, SEVEN VILLAGES AND SIX TOWNSHIPS—Continued.

	Occupied properties inspected and re-inspected.			Abatements.		
	Total.	Satisfactory.	Unsatisfactory.	Properties.	Pollutions.	Properties unsatisfactory.
Phoenixville Borough, Chester County,	6	0	6	6	11	0
Portland Borough, Northampton County,	1	0	1	1	2	0
Pottstown Borough, Montgomery County, special,	1	0	1	0	0	1
Quakertown Borough, Bucks County,	1,206	762	444	45	71	399
Quarryville Borough, Lancaster County, special,	8	0	8	8	20	0
Red Lion Borough, York County,	710	645	65	63	118	2
Rockhill Borough, Huntingdon County,	2	0	2	1	1	1
Rome Borough, Bradford County,	100	95	5	3	3	2
Schwenksville Borough, Montgomery County,	10	0	10	1	2	10
Sellersville Borough, Bucks County,	121	0	121	1	1	120
Spring City Borough, Chester County,	417	0	417	89	208	328
Spring Grove Borough, York County,	294	66	228	0	0	228
Stewartstown Borough, York County,	250	248	2	2	5	0
Swoyersville Borough, Luzerne County, special,	8	1	7	0	0	7
Tatamy Borough, Northampton County,	2	0	2	1	1	1
Tremont Borough, Schuylkill County,	257	0	257	82	164	175
Utica Borough, Venango County,	92	77	15	14	23	1
Walnutport Borough, Northampton County,	10	0	10	7	7	3
West Chester Borough, Chester County,	26	0	26	26	41	0
West Grove Borough, Chester County,	372	256	116	0	0	116
West Reading Borough, Berks County,	16	0	16	1	2	15
Wind Gap Borough, Northampton County,	3	0	3	3	4	0
Windsor Borough, York County,	210	147	63	55	132	8
Woodcock Borough, Crawford County,	43	42	1	0	0	1
Yoe Borough, York County,	159	114	45	42	86	3
Cumbola Village, Schuylkill County,	5	0	5	3	3	2
Kulpmont Village, Northumberland County,	13	0	13	1	3	12
Nuremberg Village, Luzerne and Schuylkill Counties,	170	51	119	1	1	118
Robertsdale Village, Huntingdon County,	90	51	39	1	1	38
Weston Village, Luzerne County,	120	40	80	0	0	80
Woodland Village, Clearfield County,	6	0	6	4	7	2
Woodvale Village, Bedford County,	62	39	23	0	0	23
East Union Township, Schuylkill County,	44	0	44	42	85	2
Franklin Township, Greene County,	1	0	1	1	5	0
Hopewell Township, Beaver County,	6	0	6	1	7	5
Portage Township, Cambria County,	2	0	2	1	2	1
South Bend Township, Armstrong County,	1	0	1	1	1	0
Summerhill Township, Crawford County,	3	0	3	3	3	0
Total,	14,325	7,104	7,221	1,118	2,266	6,106

SUMMARY OF SANITARY SURVEY ON CERTAIN WATERSHEDS.

Major Watersheds.	Occupied properties inspected and re-inspected.			Abatements.		
	Total.	Satisfactory.	Unsatisfactory.	Properties.	Pollutions.	Properties unsatisfactory.
Allegheny River, Erie, Forest, and Venango Counties, ..	1,287	1,133	154	13	19	141
Allegheny River, Potter County, ...	19	0	19	18	46	1
Allegheny River, Warren County, ...	1,785	1,409	376	9	16	367
Allegheny River, McKean County, ...	95	0	95	36	74	59
Schuylkill River, Montgomery County, ...	1,580	1,302	278	118	328	160
Schuylkill River, Berks and Lebanon Counties, ...	133	63	70	50	99	20
Schuylkill River, Chester County, ...	410	339	71	48	95	23
Schuylkill River, Schuylkill County, ...	7	0	7	4	8	3
Susquehanna River, Lancaster County, ...	39	0	39	7	12	32
Susquehanna River, Susquehanna County, ...	553	511	42	1	4	41
Susquehanna River, Bradford County, ...	5,543	5,190	353	194	336	159
Susquehanna River, York County, ...	190	0	190	183	296	7
Susquehanna River, Dauphin County, ...	4,507	4,389	118	31	41	87
Delaware River, Northampton County, ...	12	0	12	2	3	10
Delaware River, Monroe County, ...	186	164	22	10	16	12
Lehigh River, Northampton County, ...	15	0	15	8	12	7
Lehigh River, Luzerne County, ...	28	0	28	13	26	15
Lehigh River, Lehigh County, ...	6	0	6	4	26	2
Lehigh River, Carbon County, ...	55	0	55	34	96	21
Lehigh River, Wayne County, ...	9	0	9	4	10	5
Ohio River, Allegheny County, ...	2,054	0	2,054	43	110	2,011
Ohio River, Washington County, ...	165	0	165	86	140	79
Conemaugh River, Westmoreland County, ...	89	0	89	39	56	50
Kiskiminetas River, Westmoreland County, ...	26	0	26	8	14	18
Monongahela River, Westmoreland County, ...	1,510	843	667	158	231	509
Youghiogheny River, Westmoreland County, ...	4,846	3,913	933	160	201	773
Tioga River, Bradford County, ...	85	80	5	3	4	2
Clarion River, McKean County, ...	10	0	10	10	29	0
Total, ...	25,244	19,336	5,908	1,294	2,348	4,614

It will be noted that one thousand and seventy-eight properties on the watersheds of ice supplies were inspected and reinspected and all but one hundred and twenty-two were found to be in a satisfactory condition. One hundred and eighty-two pollutions were abated upon ninety-eight unsatisfactory properties, leaving twenty-four properties on the watersheds in an unsatisfactory condition at the close of the year.

	Occupied properties inspected and reinspected.			Abatements.		
	Total.	Satisfactory.	Unsatisfactory.	Properties.	Pollutions.	Properties unsatisfactory.
Heart Lake, Susquehanna County,	35	34	1	0	0	1
Lake Carey, Wyoming County,	1	0	1	0	0	1
Jackson Run, Warren County, Phillips Ice Company,	310	304	6	5	13	1
Octorora Creek, Oxford Borough, Chester County, ice supply,	24	15	9	0	0	9
Sugar Creek, Spalding Ice Reservoir, Troy, Bradford County,	43	0	43	38	80	5
West Branch Conococheague Creek above Richmond Dam, Cumberland Valley Railroad ice supply,	664	603	61	54	87	7
Schuylkill Haven Borough, Schuylkill County, ice supply,	1	0	1	1	2	0
Total,	1,078	956	122	98	182	24

V. EPIDEMICS.

During the year 1913, the Division of Sanitary Engineering, under the direction of the Chief Engineer, made investigations in seventeen places relative to the cause of certain outbreaks of typhoid fever and carried out instructions of the Commissioner of Health to preclude a recurrence of the disease as far as water supply, sewerage, and sanitary conditions were concerned. The places, in alphabetical order, are these:

Arnot (Dysentery).
Bethlehem.
Connellsville and South Connellsville.
Franklin.
Fullerton.
Johnsonburg.
Kutztown.
Nuremberg.
Philadelphia.
Philadelphia (special).
Rauchtown.
Reading.
Sellersville.
Sharon and Farrell.
Tarentum and Brackenridge.
West Reading.
Wrightsville.

The work done in each of these places is described in the following pages.

16. OUTBREAK OF DYSENTERY AT ARNOT VILLAGE, TIOGA COUNTY.

This outbreak involving forty-one cases of dysentery of a severe type in the Village of Arnot, Tioga County, may be attributed to the failure of the public water supply and the consequent resort to town wells. The Department's County Medical Inspector, Dr. S. P. Hakes, made an investigation, more particularly of the character of the disease. It being apparent that the public water supply played an important part, Assistant Engineer, Wm. H. Ennis, was sent to Arnot September 13, 1913, and remained there until the 15th. He was assisted in his investigation and supervision of remedial measures by Inspectors, I. F. Zeigler and A. W. Conrad.

Arnot is a mining company village of 2,500 inhabitants in Bloss Township, Tioga County, four miles west of Blossburg borough. It is forty-five years old and has decreased in population about ten per cent. during the last thirty-five years. The houses are frame and have large yards. The village is perhaps somewhat above the standard of the average mining town. The streets are not paved.

There is no sewer system. The method of sewage disposal is into privy vaults and a few cesspools, and kitchen waste and wash water are discharged into street gutters or directly on the ground. When a privy vault is nearly full a new hole is dug and the old one is covered over with earth.

About forty dug wells throughout the town and a few springs were the only source of water supply for the inhabitants prior to the installation of a public water works in 1903. The water works was investigated and will be described in detail below. The supply has failed during the dry season for each of the last three or four years. The old dug wells have never been abandoned and are resorted to at such times and subsequently there has always been more or less dysentery in the village, although no reports of this disease have been made to the office of the State Department of Health at Harrisburg. Upon the failure of the public water supply this past summer the wells were put in general use about August 18th after having been pumped out and cleaned, but not disinfected. It is reported that difficulty was encountered in cleaning one or two of the wells because of the amount of water in them. Prior to this general use of the wells many of the people had been going to them for water.

Notification to boil all water obtained from the wells for domestic purposes was given by the mining company on August 18th, by means of a bulletin board notice.

On September 12th printed notices were posted around the village under the supervision of the County Medical Inspector directed by this Department, as follows: "CAUTION: All people of Arnot are warned to boil all drinking water and water used for washing vegetables and food stuffs. By order of Sam'l. G. Dixon, M. D., Commissioner of Health."

Emergency Measures.

When the engineer and inspectors from the Department arrived at Arnot it was apparent that certain additional precautions might be taken relative to the wells. Each well was heavily dosed with chlorinated lime. The quantity was proportioned according to the water standing in the well. The chemical, in a small bag, was suspended in the well until dissolved. The wells, of course, were not used thereafter until the chemical had been dissipated in the underground waters. While this work was far from ideal it is believed it was well worth while. In all, thirty-eight wells were so treated.

A force of men was started at once ditching around the wells to exclude surface water from them. There is little doubt but that the wells had been contaminated from time to time to a considerable extent by wash from around the privies and the discharges of laundry and kitchen wastes. The privies were not adequately protected from surface wash so that during heavy rains they received considerable quantities of storm water which necessarily passed on carrying contamination with it over the surface or by seepage through the ground. The privies and wells were in close proximity. The mining company had placed lime in the vaults on the properties where dysentery had occurred.

While the Department's men were at Arnot the Mining Company placed an order for buckets so as to provide a separate bucket at each well and do away with the practice of individuals dropping private buckets, including those from infected households, in the wells.

All these precautions relative to this crude water supply, were considered merely as makeshifts and the local health officer and the superintendent of the Mining Company were directed continually to advise the people of the necessity of boiling all water as the only adequate safeguard.

Bacteriological Analysis.

Thirty samples for bacteriological analysis at the Department's Laboratories, were collected, mostly from dug wells but including a spring and a sample from the reservoir of the Arnot Water Company. The sample from each well was collected before the disinfectant was introduced therein although in some cases the introduction of the chemical in neighboring wells may have had some influence upon the samples collected subsequently from other wells. The results of the analyses are given in the following table:

SAMPLES COLLECTED SEPTEMBER 14TH.

Source.	Bacteria Per C. C.	B. Coli Per C. C.
1. Stream in dam, Arnot W. Co.,	20	0
2. Dug well, J. Cunningham,	100	2
3. Dug well, M. Brewer,	48	0
4. Dug well, Edw. Chorn,	60	0
5. Dug well, Mrs. McConnell,	40	0

SAMPLES COLLECTED SEPTEMBER 14th—Continued.

Source.	Bacteria Per C. C.	B. Coli Per C. C.
6. Dug well, H. Walden,	20	0
7. Dug well, J. Jackson,	100	0
8. Dug well, John Folsey,	600	0
9. Dug well, John Berkwas,	60	0
10. Dug well, A. Neal,	120	0
11. Dug well, H. S. Card,	600	0
12. Dug well, B. McConnell,	400	0
13. Dug well, Ben Kohler,	1,000	0
14. Dug well, L. McCabe,	120	0
15. Dug well, Chas. Anderson,	250	0
16. Dug well, J. H. Hanson,	200	0
17. Dug well, J. Connell,	80	0
18. Dug well, J. Clohessy,	9	0

SAMPES COLLECTED SEPTEMBER 15TH.

19. Spring, J. Clohessy,	8	0
20. Dug well, John Duff,	40	0
21. Dug well, Peter Johnson,	25	0
22. Dug well, Mary Larson,	3	0
23. Dug well, Thos. Fleming,	60	10
24. Dug well, D. Wilson,	0	0
25. Dug well, John Wilson,	0	0
26. Dug well, Wm. Grant,	40	0
27. Dug well, Jesse James,	2	0
28. Dug well, W. R. Smith,	2	0
29. Dug well, J. Ganey,	2	0
30. Dug well, R. E. Logan,	9	0

It should be noted that the well of Thomas Fleming, (Sample No. 23), one of the only two to show the presence of colon bacilli, contained the greatest quantity of water of all the wells examined, on account of which the mining company had not succeeded in cleaning it at the time of cleaning the other wells.

Dysentery Outbreak.

The wells are indicated as the source of infection for the outbreak of illness which became increasingly prevalent as the use of the wells increased, although the evidence is not entirely conclusive. There is nothing in the data collected relative to the cases which would show that the well of Thos. Fleming was responsible for more cases than any of the other wells. The sewage contamination in this well at the time of sampling may possibly represent the general condition of all the wells prior to their being cleaned.

The dates of onset of the forty-one cases investigated, are as follows:

Date of Onset.	Number of Cases.	Date of Onset.	Number of Cases.
July 14,	1	Aug. 25,	1
July 20,	1	Aug. 28,	1
Aug. 1,	1	Aug. 29,	1
Aug. 2,	2	Aug. 30,	2
Aug. 7,	1	Aug. 31,	1
Aug. 9,	1	Sept. 1,	1
Aug. 11,	1	Sept. 2,	1
Aug. 15,	2	Sept. 5,	1
Aug. 17,	1	Sept. 6,	3
Aug. 18,	2	Sept. 7,	4
Aug. 19,	3	Sept. 8,	1
Aug. 20,	1	Sept. 9,	1
Aug. 22,	2	Sept. 11,	1
Aug. 24,	1	Sept. 12,	2

No cause of the outbreak, other than the wells was suggested by the County Medical Inspector. The most significant feature was that eighteen of the patients were aged one to four years and sixteen were aged five to nine years, so that there

were only seven cases over ten years old. There were nine deaths, all among children of six years and younger. Nothing suspicious could be determined relative to the milk supply.

The promiscuous use of household vessels in obtaining water from the wells and the few springs may very likely have been responsible for some of the disease.

Eight of the patients asserted that they had used only the public water supply. It was always available in small quantities for a few hours a day and in certain places. If these eight cases actually used only the public supply probably some other medium of transmission than the water was responsible for their infection. It hardly seems likely that the public water supply was responsible since the cases increased as the use of this water diminished. A careful investigation was made of the public water supply and the following is taken from Mr. Ennis's report:

Public Water Works.

The village of Arnot is supplied with water by the Arnot Water Company, chartered September 14th, 1897, for the purpose of supplying water to Bloss Township, Tioga County, and to such persons residing therein and adjacent thereto as may desire the same. The water works system consists of a storage dam, filter plant, gravity supply main, and distributing pipes in the village. The system was built in 1903 and the water supply is obtained from Saw Mill Run.

Saw Mill Run has its source at a point about three miles southwest of Arnot Village and flows eastwardly to its junction with Spring Run at a point to the east of the village. Above the water works intake Saw Mill Run has a drainage area of approximately two square mile of uninhabited and uncultivated mountain land covered with a heavy growth of scrub timber. The maximum flow of the stream is not known but it is reported to be sufficient to furnish the demands of the consumers on an average of about eight months in the year. During droughts it practically dries up.

The storage dam is located about one mile southwest of the village and is built in a natural ravine between lofty hills. The dam is a wooden crib structure backed on the upstream side with earth at a slope of about one and a half to one, paved with dry rubble masonry. The structure is one hundred feet long and twenty-six feet high, back flooding an area of about two acres, which has been stripped of all vegetable matter. The average depth of the water in the dam is about six feet and the storage capacity is about 5,000,000 gallons. At the overflow the dam has an elevation of 118 feet above the principal part of the village. From the dam an eight inch gravity supply main leaving at the bottom extends eastward about 3,200 feet connecting with a system of distributing pipes in the village of Arnot.

The filter house is a frame structure located just below the dam. In it are installed a subsidence tank, a filter unit, and pumping machinery. Adjacent to the filter building is a filtered water basin also housed in a frame building. The filter plant was installed by the New York Filter Manufacturing Company.

The subsidence tank is of wooden construction twenty-one feet two inches, by twelve feet, in plan, having an effective depth of eight feet and a storage capacity of 15,120 gallons which provides a retention period of about two hours when the plant is operated at its maximum capacity. The top elevation of the subsidence tank is only six feet below the overflow of the dam and when water falls below this point, it is raised into the tank by means of a 100,000 gallons capacity triplex pump operated by an eight horse power Otto gas engine. The flow of water to the tank is through a six inch diameter pipe extending from the gravity supply main. The pump suction is connected to this line also. The six inch pipe terminates in the bottom of a weir chamber built in one end of the tank and the water, after flowing the length of the weir chamber passing over two weirs and under a submerged baffle board, enters the main tank and flows lengthwise and around two baffle boards and leaves the tank through a six inch diameter pipe located near the top and flows on to the filter. At the overflow the water in the tank has an elevation about three feet above the surface of the filter bed. By the arrangement of piping the water from the dam may be by-passed to the filter bed or around the entire purification plant and filtered water basin.

The coagulant, which is sulphate of alumina, is dissolved in a wooden tank set up on top of the settling tank. The chemical is applied to the water as it enters the weir chamber. Commonly from ten to fifteen pounds of alumina are used daily, dependent upon the character of the water. Soda ash is also used at the plant to increase the alkalinity of the water. On an average about five to six pounds of the latter chemical are used daily.

The filter is of the mechanical gravity type consisting of a single wooden tub eight feet in diameter by eight feet high. It is reported that on the bottom of the tub is a manifold collecting system consisting of a main collector from which lateral pipes extending in parallel rows on about six inch centres to within a few inches of the side of the tub. Screwed into the collecting pipes on six inch centres are strainers. On top of the strainers is placed a four foot bed of select filtering sand. The water from the settling tank flows through the six inch pipe to the filter and is distributed on to the surface by means of three three inch diameter perforated pipes extending across the top. The effluent from the filter is into a four inch diameter pipe leading to the filtered water basin. Rate controllers and loss of head gauges are not provided to regulate the operation of the filter.

The filter is usually washed with a reverse or upward current of filtered water obtained from a 15,000 gallon capacity wooden tank elevated about fifty feet above the filter. Compressed air is used to agitate the sand layers during the washing process. By the arrangement of piping in connection with the filter the first water after washing may be wasted to a sewer. It is also possible to wash the unit with either raw or settled water.

The filter plant is in charge of an attendant and is usually operated from about the middle of June to the 15th of October with an average of from fifteen to eighteen hours daily. At such times from 75,000 to 90,000 gallons of water are purified daily which provides a maximum rate of filtration of about 100,000,000 gallons an acre and day.

The filtered water basin is of concrete masonry construction fifteen feet by forty feet in plan, having an effective depth of eight feet and a storage capacity of 36,000 gallons. The filtered water enters the basin at one end and flows lengthwise through the tank to a six inch diameter pipe connected with the gravity supply main. Surface water cannot enter the basin and it is housed in a building.

The system of distributing pipes extends throughout the Village of Arnot and consists of about six miles of four inch diameter pipe to which there are 400 connections. Fire hydrants are fairly well distributed throughout the distributing system as well as on a number of dead ends. The average daily consumption is approximately 80,000 gallons of which 25,000 gallons are used for domestic and the remainder for industrial purposes by the Blossburg Coal Company.

Conclusions.

The seriousness of the situation in Arnot, due to the failure of the public water supply and the resort to the dangerous wells and springs, is in no way minimized by any slight uncertainty as to whether these wells are responsible for all of the dysentery during the past season. This instance illustrates the extreme importance of considering exhaustively not only the quality of a water supply under the varying conditions which may have influence thereon, but also the quantity available during dry seasons as compared with the demands of the consumption before such a supply can be approved by the State Department of Health as not prejudicial to public health, and a permit issued for the water works system and source of supply or additional supply or merely for the extension of the water works system so as to increase the consumption. Under the Act of April 22nd, 1905, P. L. 260, requiring a written permit from the Commissioner of Health before a public water works system may be installed or extended, this Department has adhered to the above policy so that in the installation of new water works systems disasters such as that at Arnot may be guarded against.

17. TYPHOID FEVER IN THE BOROUGH OF BETHLEHEM.

This outbreak of typhoid fever at the close of 1912 is the second which Bethlehem, population 14,000, has undergone in the last few years. It was the final blow struck at the town by the old source of municipal water supply which had been continued in use long after it should have been abandoned in view of the growth of the town and modern advances in the practice of water supply engineering. During the months of October, November, and December, 1912, there occurred twenty-one cases of typhoid and the engineering division of this Department, on January 8, 1913, was asked to make an investigation which was carried on from the 8th to the 14th of the month by Assistant Engineer H. E. Moses and Inspector W. W. Ritter. Mr. Moses' report is quoted below.

This same water supply was also the cause of the previous epidemic which occurred during August, September and October, 1911, comprising 105 cases of typhoid, preceded by an outbreak of dysentery which afflicted practically the entire population in the municipal water district. This epidemic in 1911 came as a climax to the increasingly unsatisfactory conditions in connection with the public water supply. The investigation and suppression of this epidemic have already been reported in detail.

The public water works system was originally established in 1761 and in 1872 was purchased by the borough, which made some improvements. In 1911, however, the supply was still derived from a spring and well located on the east bank of Monocacy Creek, not far from its mouth in the Lehigh River, and between the high bluffs on either side, above which are located the old town of Bethlehem to the east and to the west the recently annexed portion of the borough once known as West Bethlehem. The sewage of these two communities, in quantities increasing largely in recent years with the extensive increase in house sanitation, is discharged almost entirely into the underlying cavernous limestone formation of these hills. The spring was probably a pure supply for many years but the extent of its pollution recently is shown conclusively in previous reports of this Department, as well as in what follows. There was also an emergency intake in Monocacy Creek. The municipal supply is furnished only in the old town; the West Bethlehem district and the borough of South Bethlehem and surrounding districts are supplied by the Bethlehem City Water Company with filtered Lehigh River water.

The local agitation for a better water supply was first brought to the attention of this Department in 1907, at which time the Commissioner of Health in a formal

decree condemned the existing source of supply and ordered the local authorities to prepare plans for a pure supply. Without first receiving approval of this Department, the borough installed two drilled wells at Illicks Mills in the Monocacy valley, a mile above the town. Subsequently, on July 16, 1908, a formal permit was issued for this source of supply in response to an application, since tests did not reveal any contamination, although this permit specifically called attention to the fact that,

> "Though the wells are deep and at a considerable distance from thickly built up communities it is not at all impossible that their water may at some time be polluted by the waters from Monocacy Creek or sewage from Bethlehem, more especially if the water in the well is maintained at a considerable distance below the surface. Therefore, frequent bacteriological tests of this water shall be made."

The epidemic of 1911 occurred, however while the municipal authorities were consummating the arrangements for the introduction of the new supply. After this calamity matters progressed more rapidly. The installation during the epidemic of an emergency chemical disinfecting plant at the old spring under the supervision of the State Department of Health, and subsequently its replacement by a more complete plant are set forth in a previous report. It was during this time that the municipal authorities placed the supervision of the water works system under an experienced bacteriologist.

As a temporary measure the borough was accustomed to secure an auxiliary supply from a drilled well on the property of the Bethlehem Silk Mill located along the Monocacy Creek about half a mile up-stream from the borough pumping station. This water was used in the summer of 1911 and out of fourteen samples collected between August 28th and October 12th and analyzed by the Department, six showed the presence of sewage organisms in small numbers. The Department supervised the installation of a hypochlorite plant at the mill. This supply when used thereafter was treated.

The complete plans for the introduction of the new source of supply from the drilled wells at Illicks Mills were presented for the approval of this Department on January 17, 1912, and on March 4, 1912, the plans were approved in a formal permit under certain conditions and stipulations of which the following are particularly pertinent:

"*FIRST:* That the improvements as soon as completed shall constitute the only source of water supply to the borough and that the present pumping station shall be abandoned including the spring and the well supply at said station. The pumps shall be dismantled and all connections between the distributing system and the said spring and well shall be absolutely severed. And, furthermore, the supply at the silk mill shall be abandoned and the connection to the water works system at that point shall be severed."

"*SECOND:* The borough shall install duplicate apparatus at the Illicks Mills pumping station for the reasons hereinbefore given."

"*THIRD:* The borough shall install a hypochlorite of lime treatment plant at the Illicks Mills Pumping Station and maintain the same in constant readiness for the treatment of the public water supply and the borough shall have made twice weekly bacterial tests of its source of supply and whenever it appears that such supply is polluted, the water shall be treated with a germicide."

"*FOURTH:* The local authorities should anticipate the installation of a water filtration plant. If at any time in the opinion of the State Department of Health the water works system or any part thereof or the water supplied thereby is prejudicial to public health, then such remedial measures shall, including possibly a filtration plant as the Commissioner of Health may advise or approve, be provided by the borough."

"*SIXTH:* The introduction of water into the town by means of the public water works system of the borough under any other condition than those specified in this permit will be considered to be and will be the obtaining of an additional water supply without the consent of the State Department of Health and will be in violation of Act Number One Hundred and Eighty-two of the General Assembly, approved April twenty-second, nineteen hundred and five, for which penalties will be enforced to the full extent of the law."

The report of Assistant Engineer Moses on the operation of the water works system during 1912 and 1913, and on the epidemic and such measures as were instituted for the betterment of the local conditions is as follows:

Water Works Operation.

From records obtained it appears that the old source of water supply, namely, the spring in the borough, was used until November 5, 1912, at which time water from the wells at the Illicks Mills plant was first furnished the citizens of Bethlehem. This water was not subjected to any treatment. This constituted the entire supply until November 18, 1912, on which date recourse was had to the old spring supply on the advice of the borough's bacteriologist because he had found in his

analysis of samples of water obtained from the Illicks Mills wells indications of sewage pollution of this supply, and as the plants at Illicks Mills had been started before any apparatus was installed by means of which this water could be treated, the borough's hypochlorite plant being still located at the old pump station. The permit issued to the borough approving the new source of water supply, intended that apparatus should be installed with the new supply so as to be ready to treat this water if it should be necessary, but the borough authorities started this plant without putting in the necessary devices.

Water was pumped from the spring until November 29th and during the interval, between November 18th and 29th, the hypochlorite plant was moved from the old pumping station in the borough to the pumping station at Illicks Mills and there was set up at the old pumping station the original hypochlorite dosing apparatus installed in August, 1911, under the supervision of the State Department of Health. Also, during this time tests were made of the well water at Illicks Mills to determine, if possible, the source of the contamination then apparent. The wells were tested separately and both together. A higher degree of contamination appeared when the wells were operated separately, the natural inference being that the heavy draught on a single well probably drew more largely on some polluted source or several of them. It was thought that possibly surface contamination found its way into the wells from properties located in the immediate vicinity of the pumping station, or possibly from Monocacy Creek itself, this stream flowing directly past the plant. It was reported that surface springs and shallow wells in the vicinity of the pumping station were affected, the water level therein being lowered when a heavy draught was made on the drilled wells.

On one other occasion in 1912, subsequent to this first return to the old supply, recourse was had to the old spring supply, namely on December 14, when the pumps at the old station were operated for approximately eight hours. The next date of operation of these pumps was on January 2, 1913, they then being run for nine hours. While officers of the Department were investigating the typhoid fever outbreak during January, 1913, notice of an intended resumption of the spring supply was brought to the attention of these representatives and the borough council was verbally notified not to use this water. However, on January 21st, use of this supply was again resumed, being continued until January 22, a total of about twenty hours.

It appears that the pump installed at the Illicks Mills Station did not develop the efficiency expected of it under the high friction head in the force main, with the subsequent result that there was a daily deficiency in the supply to the standpipe, resulting finally in such a low level of water therein that the borough was obliged to start up the pump at the old station to make up this deficiency. It was proposed to overcome this state of affairs by substituting larger impeller blades in the centrifugal pump at the Illicks Mills station which was accomplished on January 22, 1913, and resulted in an increased efficiency. Also, on July 5, 1913, an additional pump of two million gallons capacity was installed in connection with this pumping station. During the summer of 1913 water was obtained at various times between May 25th and July 5th from the well at the Bethlehem Silk Mill and part of the time was not treated with hypochlorite. After June 26th, when this water was used, the hypochlorite was also used. The supply from the wells at Illicks Mills, at times during 1913, was not treated with hypochlorite and the Department's records show that in December, 1913, the use of hypochlorite with this supply, was discontinued, although the apparatus is maintained in readiness for an emergency.

Typhoid Fever Outbreak in Bethlehem.

In severity, the typhoid fever outbreak occurring in the latter part of 1912, investigated during January, 1913, is not comparable with that occurring in 1911, to which reference has already been made. Studies were made regarding twenty-one cases of typhoid fever occurring in Bethlehem during October, November, and December, 1912. One case occurred in October, four in November, and sixteen in December. There was a total of thirty-five cases for the entire year. The onset by days of the twenty-one cases is shown in the following table:

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	
1,	1	.....	.....	15,	.....	1	.....	
3,	.....	.....	1	16,	.....	1	1	
4,	.....	.....	1	23,	.....	.....	1	
6,	.....	.....	1	25,	.....	1	.....	
9,	.....	.....	1	28,	.....	1	1	
10,	.....	.....	1	30,	.....	.....	1	
11,	.....	.....	1	31,	.....	.....	1	
12,	.....	.....	1					
13,	.....	.....	1					
14,	.....	.....	3		1	4	16	21

The onset of the one case in October has been set as October 1st. This was the case of a woman who had been ailing from another cause from August 19th and a positive diagnosis of typhoid fever was not made until December, 1912. The real date of onset, accordingly, is rather uncertain and the case probably should be placed among those occurring later. The next case in point of onset came down on November 15 and was an imported case, the patient having worked in Lehighton for two months prior to his illness. His home in Bethlehem was on the west side not far from the old borough pumping station. He was ill when brought home. The investigation on these premises showed that the sanitary conditions were not particularly good. It is thought that possibly infected waste from these premises may have found its way into the underground caverns and later through the public water supply have become the source of infection of other cases nearly all of which were on the east side of the Monocacy Creek. As a matter of fact only three of the twenty-one cases were in West Bethlehem. The Department referred to such a possibility as far back as 1907. It appears that the limestone deposit from which issues the spring, formerly used for the borough's water supply, is said to have its strike north and south and to pitch in such a way as to permit house drainage from the town west of Monocacy Creek to find its way toward the spring.

In the epidemic of 1911 West Bethlehem was practically free from typhoid fever and dysentery and this time eighteen of the cases studied were located in Bethlehem proper to the east of Monocacy Creek. Of this number, eight form a more or less well defined group placed in the southern part of the town near the old pump station. One of these cases was a secondary. The remaining ten cases were scattered throughout Bethlehem with two in the vicinity of the standpipes, four located within three squares on a parallel street two blocks to the north, and the other four scattered in the section nearest Monocacy Creek.

With reference to the water supplies used, the facts are shown concisely in the following table, in which it is seen that by far the greater number of the patients using one single supply had used that furnished by the Bethlehem borough municipal system:

Water Supplies Used by Typhoid Patients in Bethlehem.

Bethlehem borough municipal supply, only,	9 cases
Bethlehem borough municipal and cistern,	6 cases
Bethlehem City Water Company supply, only	1 case
Both public supplies and others,	3 cases
Various supplies,	2 cases
Total,	21 cases

The Bethlehem borough municipal system is the only public supply in the old part of Bethlehem east of Monocacy Creek. As previously stated this district contained all of the above cases except three. The first was imported, practically the original case of this outbreak, and occurred November 15th. The second case, although living in West Bethlehem used the municipal supply regularly. The third case was a six-year-old boy. Nothing very definite can be said as to the origin of this case. He may have drunk municipal water while away from home.

Unless this outbreak can be ascribed to an infected water supply, it must be classed as unknown, except where definite causes have been assigned in the instances of the secondary and the imported cases. The significant feature of the outbreak, as appears from the table showing the onsets, is that all but five of the cases came down in December, that is, after the spring water had been again pumped into the mains subsequent to the furnishing of the supply from the Illicks Mills wells. The spring water supply was furnished the public up to November 5th and the well water from November 5th to 18th and during this interval two cases occured, one of which was imported, the other being classed as unknown. On November 18th the borough started pumping from the old spring continuing until the 29th and during this period two additional cases came down, one on the 25th and the other on the 28th. But about two weeks after the spring water was first pumped into the mains the December cases started to come down, the first one with an onset on December 3rd, from which time to the 16th, inclusive, twelve cases occurred.

The following table shows the age periods of the cases studied:

Ages.	Male.	Female.	Total.	Classification.	
0-4,	1	0	1	Infants,	1
5-9,	2	2	4	Children,	4
10-14,	3	2	5	Minors,	6
15-19,	0	1	1		
20-24,	2	1	3	Of age,	7
25-29,	3	1	4		
30-34,	0	2	2		
35-39,	0	0	0	Middle age,	2
40-44,	0	0	0		
45-49,	0	0	0		
50+,	1	0	1	Old age,	1
Total,	12	9	21	Total,	21

From the classification shown in this table it is seen that the great majority of the cases fall into the early age period, in fact, all but three were under thirty years of age. It is a known fact that in communities having a water supply subject to more or less continuous contamination there appears to be a certain immunity acquired by the users of such a supply, so that in case of an outbreak of a water borne disease it is expected that the disease will have its greatest prevalence among those falling into the early age period because they have not, through long continued use of this supply, developed the immunity which their elders have. This may be the case in this instance.

In addition, a study of the various occupations of the patients, as shown in the table below, reveals the fact that fourteen of the twenty-one cases may be classed as "stay-at-homes." This grouping includes four housewives, eight students and two children. Again the most of these fall into the early age period, and, as a rule, persons in this group make use of but the one public water supply, whereas persons engaged in various occupations travel around considerably and are more likely to use a varied supply.

Occupation.	No. Cases.	Classification.	
Housewife,	4	Stay-at-Homes:	
Student,	8	Housewife,	4
At home,	2	Student,	8
Carpenter,	1	At home,	2
Huckster,	1		
Factory,	2	Total,	14
Brick mason,	1	Miscellaneous,	7
Machinist,	1		
Laborer,	1		
Total,	21	Total,	21

In connection with the study of this outbreak all possible sources of infection were looked into, and this, of course, included the use of raw shell fish and ice, as well as milk. Of the twenty-one patients fifteen had used no raw shell fish, while six had at various times used food of this character obtained from as many different sources. Only four had used any ice within a month prior to their illness and this was of the manufactured variety.

An investigation of the milk supplies used shows that there were fifteen supplies involved in the twenty-one cases. Four of the supplies served two patients each; one supply had three of the patients and ten individual dealers served one patient each. In view of these facts milk must be eliminated as a possible source of infection. Notwithstanding this conclusion, when the officers of the Department learned that some of the milk men were taking containers from homes in which cases of typhoid fever existed, a prompt order was given to milk men through the local Board of Health to cease this practice. From the records it appears that at that time there were twenty-nine dealers serving milk in Bethlehem and to each one a copy of the following letter, issued by the local Board of Health, was sent on January 11, 1913:

"Referring to Section 8 of the milk license which is a part of the borough ordinance, and which license has been executed by you, and is in the hands of the

Borough Secretary, Mr. Victor E. Tice, would advise that it has been discovered that empty milk containers or bottles have been taken away from several houses wherein exist cases of typhoid fever.

"We wish to respectfully but with emphasis notify you that this practice is in direct violation of your contract with the borough as a milk vender and also in direct violation of the ordinance, and is punishable as a misdemeanor, with a fine as prescribed by the ordinance.

"The clause or section referred to is as follows, to wit:—

"'I also agree not to take any vessel used for the purpose of conveying milk, from any residence in which there is or has been a case of contagious disease, until said vessel has been thoroughly disinfected, according to the rules and regulations established by the Bethlehem Board of Health.'"

"We trust that you have not been guilty of any violation of this ordinance, and that you will be governed accordingly by the instructions contained in our letter."

Considering all the facts collected concerning these cases, the most likely source of infection appears to have been the public water supply obtained for a short period of time from the old spring which was known to be dangerous and which had been condemned by the State Department of Health. It is presumed that while this water was being pumped it was also being treated with a germicide, but the Department knows that on occasions prior to this time there had been neglect in the dosing of this water. At this time a short period may have occurred in which the water was not dosed when an infected supply may have been pumped into the system, possibly in a small amount, and have been the cause of the disease among these patients. The fact that the outbreak was not more wide spread may be accounted for by supposing that such lapses in the dosing were probably of comparatively short duration and the water which passed at such times was mixed to a certain extent with the dosed water immediately preceding and following, thus accomplishing some degree of disinfection. Weight is given to this theory by the fact that eight of the cases were grouped near the old pumping station where any such mixing of undosed water would not have taken place.

For purposes of comparison there are inserted here tables showing typhoid fever cases occurring in Bethlehem from 1904 to 1913, inclusive, the figures given having been reported to the Department. It is quite probable that those for the last few years appearing in the table are more accurate than for the first few years. It is well known that during the first few years of the existence of the Department considerable difficulty was encountered in securing accurate reports from physicians.

Month.	Year.									
	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
January,	0	0	1	0	1	0	5	0	2	7
February,	1	0	0	0	1	0	1	0	0	2
March,	1	1	0	0	0	0	3	0	2	1
April,	0	0	0	0	0	4	2	1	0	1
May,	0	0	0	0	0	0	0	1	1	1
June,	0	0	0	1	0	1	1	0	4	1
July,	0	0	0	2	4	0	1	0	0	0
August,	0	0	0	4	13	1	4	18	5	4
September,	0	0	0	1	6	1	2	69	2	2
October,	0	0	4	2	11	3	6	17	1	5
November,	0	0	0	0	6	2	3	1	1	0
December,	0	0	0	1	1	0	2	2	17	0
Total,	2	1	5	11	43	12	30	109	35	24

The other table shows the cases of typhoid fever by years 1908 to 1913, inclusive, for the municipalities comprising what is known as the Bethlehem district. Proportionately, the case rate is higher in Bethlehem than in South Bethlehem and the other boroughs, in which, of course, the Bethlehem municipal supply is not furnished.

Name of Place.	Year.						
	1908.	1909.	1910.	1911.	1912.	1913.	Population in 1910.
Bethlehem,	43	12	30	109	35	24	12,837
South Bethlehem,	53	25	65	*95	32	29	19,973
Fountain Hill,	1	1	0	4	3	0	1,388
Northampton Heights,	.....	3	0	7	0	1	1,037

*Epidemic attributed to water at local industrial plant.

Summary.

The outbreak was of short duration. There were too few cases to form an absolutely definite conclusion as to the source of infection but, as before stated, the evidence to a polluted water supply. As precautionary measures the milk dealers were notified to use the proper care in the distribution of this food product; cases of insanitary conditions at homes where typhoid fever cases existed were reported to the proper health authorities, with the result that orders were issued to make the necessary corrections at such places so as to reduce the possibility of contact cases following the primary cases housed in such dwellings; plugs were opened at various points on the water works system so as to flush the distribution system; and a careful investigation of the entire water works system, particularly as relates to the Illicks Mills supply, was instituted.

The property owners in the neighborhood of this pumping station were interviewed in an endeavor to secure any light on the probability of a contamination of this source of supply from a surface source in the immediate vicinity of the wells. Stories were afloat to the effect that when heavy draughts were made on the wells at Illicks Mills the water supply in the shallow dug wells on several farms in this locality was considerably diminished or entirely exhausted. Conflicting testimony on this point was had. The borough of Bethlehem did, however, enter into an agreement with one of the property owners to supply him with water from the wells through a pipe carried to his dwelling because said property owner claimed that the pumping of the drilled wells at the Illicks Mills Pumping Station had damaged his water supply. By this agreement the borough was released from damages. The borough did not admit the claims of the owner of this property but made the agreement in order to save litigation. It is possible that further tests will be made by the borough to determine whether surface contamination can get into these drilled wells and this is of course advisable. One thing at least is certain, the borough should not use the old spring supply as there cannot be any doubt as to its pollution by sewage and the danger attendant on the use of such a source of public water supply.

18. TYPHOID FEVER AT CONNELLSVILLE AND SOUTH CONNELLSVILLE.

In Connellsville and the surrounding district there has been continuously a high typhoid fever record, but in January of this year the cases reported were strikingly more numerous than before and it was deemed advisable to make an investigation. Accordingly Assistant Engineer Christian L. Siebert was sent to Connellsville on February 5th and his report of the investigation and emergency measures instituted is given below.

The city of Connellsville is situated on the north central part of Fayette County and lies on both sides of the Youghiogheny River. Its population is estimated at 15,000 and it is the centre of the famous coke district, the coke industry being the leading one in the borough. The Frick Coke Company, the Sligo Iron and Steel Company, and the Soisson Fire Brick Company are the principal works in the town. The Pittsburgh and Lake Erie, Western Maryland, Baltimore and Ohio, and Pennsylvania Railroads enter the town, and excellent interurban trolley service is maintained by the West Penn Railways Company to Uniontown, Greensburg, Scottdale, and other neighboring towns.

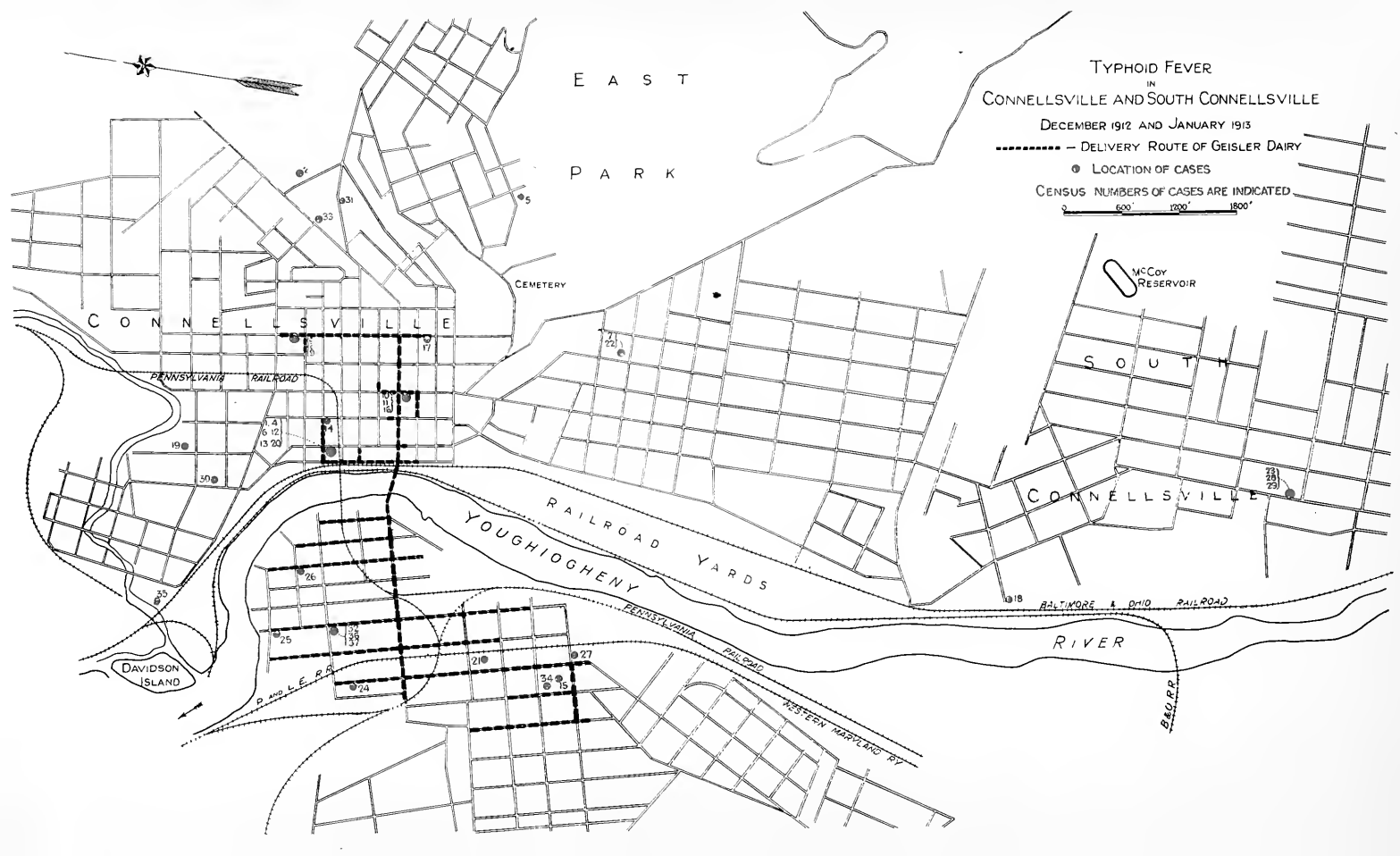
South Connellsville is a newly created borough of nearly 1,000 population. It is located immediately beyond the southern line of Connellsville. The American Sheet and Tin Plate Company a few years ago operated a large plant at South Connellsville but this has been abandoned.

Typhoid Fever.

There were thirty-seven cases in all and the salient feature noticed in the tabulation was that twenty-one of them were supplied with milk from the Geisler dairy, while no other dairy supplied more than three cases and the Geisler dairy had no more customers than several others. This evidence was strong enough to warrant a thorough investigation at the Geisler dairy farm, and on February 10th Dr. O. R. Altman, County Medical Inspector, and the writer visited and inspected the premises.

Geisler Dairy Farms.

The Geisler dairy farm is well situated on a sloping hillside in Dunbar Township about four miles south of Connellsville. The dairy is owned and operated by John and Andrew Geisler, who, with their families, reside on the premises. John Geisler's family consists of his wife, their eleven children aged between one and twenty-three years, Mrs. John Geisler, Jr., and her infant son and three children of Mrs. Fankhauser, who is a daughter of John Geisler. Andrew Geisler has no children and he and his wife live in a wing separated from the main part of the house. The total population of the house is twenty but it is a large house


TYPHOID FEVER
IN
CONNELLSVILLE AND SOUTH CONNELLSVILLE
DECEMBER 1912 AND JANUARY 1913
---------- — DELIVERY ROUTE OF GEISLER DAIRY
● LOCATION OF CASES
CENSUS NUMBERS OF CASES ARE INDICATED
0 500' 1200' 1800'
EAST
PARK
CEMETERY
McCOY RESERVOIR
CONNELLSVILLE
SOUTH
CONNELLSVILLE
PENNSYLVANIA RAILROAD
RAILROAD YARDS
YOUGHIOGHENY
RIVER
PENNSYLVANIA RAILROAD
BALTIMORE & OHIO RAILROAD
WESTERN MARYLAND RY
P AND L.E.R.R.
B&O.R.R.
DAVIDSON ISLAND

and appeared clean and in order at all times. A well constructed privy is located about fifty feet south of the house on ground lower than and sloping away from all other buildings and over two hundred yards distant from a stream.

The stable is a large, airy building well constructed and cleanly kept. The floor is of brick laid in concrete, except in front of the stalls where it is of clay. Well sloped gutters insure good drainage and running water is available for flushing. Manure is hauled to the fields each day and is never allowed to accumulate in or near the stable.

The water supply of the stable is a spring about eight hundred feet to the northwest near the crest of a hill and much higher than any of the buildings on the Geisler farm or any neighboring farm. The spring is walled in and covered and is piped to the barn and the watering trough, the domestic supply being taken from the constantly flowing influent at the latter place.

The spring is said to have a constant flow and even temperature and it is never known to become turbid. From a physical examination the source of supply would be considered ideal and the results of analyses appended to this report confirm this opinion.

There were thirty-four cows, all clean fine looking animals, at the Geisler farm at the time of the investigation. The daily yield of milk was said to be about forty gallons. All milk is cooled in cans immediately after milking by allowing the cans to stand in the watering trough in the flowing spring water for a considerable time. This is a large trough and kept clean. It is a watering trough only in name for the stock is watered at another trough in the stable.

In addition to this supply milk is bought from two neighbors, Dourns and White, in quantities of eight and two gallons a day, respectively. These two dairies were inspected and found to be in good condition, with no history of typhoid fever on either farm.

The milk is distributed only in cans and no mixing is done either at the farm or in the wagon. The cans and all other containers are scrubbed and washed each day with hot water containing soap powder, scalded, and finally rinsed several times in fresh spring water. The methods practised seem to be above reproach under ordinary conditions.

The route followed in distributing milk is shown on the map accompanying this report. About one hundred customers are supplied in the West Side of Connellsville and ten hotels and a few families are supplied in old Connellsville.

History of Illness on Geisler Farm.

The following facts were learned from the family physician, Dr. G. W. Gallagher, and from members of the Geisler family. On October 19th, 1912, Lewis Fankhauser, a son-in-law of John Geisler, developed typhoid fever on the Johnson farm near Mont Braddock in Dunbar Township. He was taken to the house of John Geisler on October 21st, 1912, and died on November 14th. His family, a wife and three children, from that time made their home with John Geisler. Beginning November 20th Mrs. Lewis Fankhauser suffered a two weeks' illness diagnosed as grippe and on January 12th, 1913, she was confined. Adela Fankhauser, age two years, was taken sick December 4th, 1912, with so-called pneumonia (not typical) and recovered in about two weeks. Beginning December 26th Joseph Geisler, age twelve years, son of John Geisler, suffered an illness of about two weeks' duration diagnosed as grippe. The physician was in doubt for several days of his diagnosis of the latter case, but because of the quick recovery he felt sure it was not typhoid fever. On February 1st, 1913, Francis Geisler, age nine years, was taken sick and on February 10th both Dr. Gallagher and Dr. Altman diagnosed the case as typhoid fever. Specimens of blood for Widal tests were taken from Francis Geisler, the sick boy, Lewis Geisler, age seven years, who showed signs of fever, but felt well the following day, and Helen Geisler, age seventeen years, who had entire charge of the distribution of the milk, but who evidenced no symptoms whatever of any illness. All these Widal tests were found negative at the laboratories of the Department, but Drs. Gallagher and Altman did not change their diagnosis of Francis Geisler, and this case has since run the course of typhoid fever.

Action Taken.

Having decided in conference with County Medical Inspector, Dr. Altman, that the history in the Geisler family indicated that all or some of the illness may have been typhoid fever in an atypical form and that the epidemiological findings were sufficient evidence to warrant precautionary measures being taken at the dairy it was determined to follow the usual steps in case of typhoid fever on a dairy farm. Accordingly the writer personally sterilized every milk can and measure by steaming for forty minutes and carefully washed all milk pails and other open utensils with a strong solution of chloride of lime. All the cleaned and sterilized containers were then placed in the milk house without having come in contact in any way with any of the members of the family. In the meantime Mr. Dunn, health officer of Dunbar Township, had been notified of the circumstances and he fumigated the wing of the house occupied by Andrew Geisler and

the clothing of all those occupied in the handling of the milk. These were John Geisler, driver of the milk wagon; Helen Geisler, distributor of milk; Andrew Geisler, milker, and Mrs. Andrew Geisler. These four were then ordered to live in the wing of the house, to have no communication whatever with those living in that part of the house occupied by the patient and to wash frequently, especially before handling the milk, using mercury bichloride tablets supplied them.

The Geisler brothers were apparently sincere in wishing to exercise the greatest care in their dairy and the steps taken were very much appreciated by them. They were made to understand the dangers of infection of the milk and the precautions necessary to avert such danger and the writer felt positive that they could be entrusted with the operation of the dairy under the circumstances. The township health officer was instructed to make occasional visits to the dairy to see that it was being operated as advised and that all necessary precautions were being taken.

Other Milk Supplies.

To make the investigation complete it was intended carefully to inspect all other dairies supplying Connellsville and South Connellsville and to collect complete data, with particular reference to any history of typhoid. Upon asking the local health officer to furnish a list of all the dairies it was found that the records of the Board of Health were incomplete and that the ordinance concerning dairy registration and inspection was not generally enforced. Consequently it was impossible to make a thorough study of the dairies. Other than the Geisler dairy the only thing of importance was the trading of bottles by William H. Baer, a town distributor, with Lloyd Cox, a typhoid patient at 130 Snyder street. The borough health authorities were instructed to see that this practice was discontinued. The general data on milk were too incomplete to incorporate in this report.

The following table shows the number of cases of typhoid as to milk supplies:

Typhoid Fever Cases Among the Customers of Milk Dealers.

Dairy.	Number of Cases.	Number of Consumers.
John Geisler & Brother,	21	100 families and 10 hotels.
Frank Zacharius,	2	175 families and 2 hotels.
William Sampson,	3	No information, not registered.
Mrs. Herd,	2	One cow, not registered.
Johnson,	1	12 customers.
Bailey,	1	No information, not registered.
William H. Baer,	1	200 customers.
Striner,	1	50 customers.
W. E. Coughenoor,	1	300 customers.
Abe Lieb,	1	No information, not registered.
Mrs. Dublin,	1	One cow, not registered.
Samuel Cohr,	1	No information, not registered.
	37	

Water Supply.

All of the cases of typhoid used the city water which is supplied by the Connellsville Water Company, a subsidiary of the American Water Works and Guarantee Company of Pittsburgh. There are very few private water supplies, it being estimated that about 13,000 of the 15,000 population regularly use the city supply.

The water works system as operated since the summer of 1912 consists of two supplies,—McCoy reservoir and filtered Youghiogheny River water.

McCoy reservoir is situated on McCoy Run in the eastern part of South Connellsville and about one mile south of the Connellsville city line. A dam forms the basin for the reservoir which has a storage capacity of about five million gallons. The supply from this reservoir is not sufficient to furnish all the water from Connellsville. It is connected to the low level system and is supplemented from the filtered water force mains, which are under higher pressure.

The filter plant and pump station are located on the east bank of the Youghiogheny River about two miles above Connellsville. The filters consist of three cylindrical horizontal pressure filters installed by the New York Continental Jewell Manufacturing Company. These filters are operated as gravity filters and have a capacity of close to two million gallons a day. The force main from the pumps is connected to the distributing system of the town and supplements the supply from the McCoy reservoir, the reservoir acting really as an equalizer. It is impossible to determine which parts of the town are supplied with McCoy reservoir water and which with filtered water.

The watershed of McCoy Run is sparsely inhabited and the water has been considered satisfactory, the results of analyses being generally good. The filter plant is not as good as might be desired, but the results of analyses of water samples collected by Department officers fail to show that the supply was then polluted. The results are appended to this report.

The condition of the water supply and the nature of the outbreak do not seem to indicate that the typhoid could be entirely water borne. If the cases were more numerous and not confined in any one district, or if the facts did not as clearly indicate another source of infection the water might be considered in dealing with the cause of the abnormal frequency of typhoid, but as it is, it cannot be regarded as the primary source of the epidemic.

BACTERIOLOGICAL ANALYSES OF WATER SAMPLES COLLECTED AT CONNELLSVILLE, MADE BY THE LABORATORY OF THE STATE DEPARTMENT OF HEALTH.

	Bacteria Per C. C.	B. Coli Per C. C.
Received at Laboratory January 11th.		
1. Geisler farm, upper spring,	100	0
2. Geisler Farm, upper spring,	40	0
3. Geisler farm, barn, spring line,	40	0
4. Geisler farm, influent to water trough,	7	0
5. Tap 301, Snyder St. (Breakneck reservoir),	17	0
6. Tap Hotel Royal (filtered water),	17	0
Received at Laboratory February 13th.		
7. Raw water,	130	0
8. Tap, filter No. 1,	0	0
9. Tap, filter No. 2,	3	0
10. Tap, filter No. 3,	0	0
11. Tap, 308 Willis Road,	70	0
12. Tap, Hotel Royal,	125	0
Received at Laboratory February 14th.		
13. Raw water,	50	0
14. Tap, filter No. 1, 8 hours after washing,	0	0
15. Tap, filter No. 2, 8 hours after washing,	2	0
16. Tap, filter No. 3, 8 hours after washing,	8	0
17. Tap, pump station,	1	0
18. Sedimentation tank,	45	0
19. Mrs. Shellenberger, tap, S. Connellsville,	1	0
20. Clyde Wilmer, tap, Allegheny & Third Sts., S. Connellsville,	5	0
21. W. S. Rimer, tap, S. Connellsville,	3	0
22. Atlas Hotel, tap, S. Connellsville,	3	0
23. Hotel Royal,	50	0
24. Tap, Dull's Livery,	60	0

CONNELLSVILLE TYPHOID CASES.

	Name.	Age.	Date of Onset.	Place of Employment or Occupation.	Residence.	Milk Supply	Number of Cases Possibly Caused by Contact.
1	Nicholas Hoye,	39	Dec. 1, 1912,	B. & O. Railroad,	Baltimore House,	Geisler.	
2	Bertha Beal,	24	Dec. 3, 1912,	Reimer's Bakery,	105 Robbin street,	Bailey.	
3	Eleanor Ashe,	18	Dec. 5, 1912,	Housewife,	312 N. Prospect street,	Geisler.	
4	Raymond Murray,	22	Dec. 12, 1912,	B. & O. Railroad,	Baltimore House,	Geisler,	1
5	George Porter,	46	Dec. 14, 1912,	Store clerk,	306 Willis Road,	Striner.	
6	Mary O'Hara,	11	Dec. 15, 1912,	Parochial school,	Baltimore House,	Geisler,	1
7	William Guthrie,	21	Dec. 18, 1912,	B. & O. R. R. storeroom,	308 E. Washington street,	Herd,	1
8	Harry Ashe,	23	Dec. 18, 1912,	B. & O. R. R. clerk,	312 N. Prospect street,	Geisler,	3 (1?)
9	Thomas Ashe,	1	Dec. 20, 1912,	Infant,	312 N. Prospect street,	Geisler,	3
10	Jennie McFarland,	45	Dec. 20, 1912,	Housewife,	Wymon Hotel,	Geisler.	
11	Lindey McFarland,	22	Dec. 20, 1912,	Hotel clerk,	Wymon Hotel,	Geisler.	
12	Thomas O'Hara,	10	Dec. 20, 1912,	Parochial school,	Baltimore House,	Geisler,	1
13	Martin O'Hara, Jr.,	9	Dec. 20, 1912,	Parochial school,	Baltimore House,	Geisler,	1
14	Ethel Johnson,	17	Dec. 20, 1912,	Domestic,	201 W. Peach St.,	Geisler.	
15	Clara Baker,	18	Dec. 20, 1912,	Graham's Pharmacy,	1008 W. Green St.,	Geisler.	
16	Harry Inzel,	25	Dec. 21, 1912,	Hotel clerk,	Wymon Hotel,	Geisler.	
17	Winifred King,	21	Dec. 22, 1912,	At home,	112 S. Prospect street,	Coughenour,	
18	George Shallenburger,	8	Dec. 24, 1912,	Public school,	Pine street,	Lieb,	
19	Lawrence Desmone,	8	Dec. 28, 1912,	Public school,	605 Highland avenue,	Johnson.	
20	Pauline Virhosky,	16	Dec. 31, 1912,	Domestic,	Baltimore House,	Geisler,	1,4,6,12,13
21	Porter Hough,	21	Jan. 1, 1913,	Cokeworker,	216 N. Seventh street,	Cohr.	
22	Esther Guthrie,	11	Jan. 2, 1913,	Public School,	308 E. Washington street,	Herd,	7
23	William Griffith,	34	Jan. 2, 1913,	B. & O. R. R. shops,	First St., near Park Ave.,	Sampson,	7
24	Ernest Yaw,	10	Jan. 3, 1913,	Public school,	112 N. Eighth street,	Geisler.	
25	Solomon Lepley,	47	Jan. 3, 1913,	Machinist,	228 N. Sixth street,	Geisler.	
26	J. P. Bute,	57	Jan. 6, 1913,	Retired,	208 N. Third street,	Geisler.	
27	Raymond Giffin,	12	Jan. 8, 1913,	Public school,	501 S. Eighth street,	Condensed.	
28	Albert Griffith,	6	Jan. 14, 1913,	Public school,	First St., near Park Ave.,	Sampson,	23
29	Raymond Griffith,	8	Jan. 14, 1913,	Public school,	First St., near Park Ave.,	Sampson,	23
30	Herbert Ellis,	11	Jan. 14, 1913,	Public school,	509 York street,	Dublin.	
31	Lloyd Cox,	20	Jan. 17, 1913,	B. & O. R. R. shops,	130 Snyder street,	Bear,	23
32	Helen Wood,	4	Jan. 26, 1913,	Infant,	152 N. Sixth street,	Geisler.	
33	Florence Swan,	20	Jan. 27, 1913,	McCrory Store,	341 E. Main street,	Zacharius.	
34	Fred. R. Yoder,	34	Jan. 28, 1913,	High school teacher,	415 S. Ninth street,	Geisler.	
35	Samuel Caligure,	5	Jan. 30, 1913,	Infant,	548 Railroad street,	Zacharius.	
36	Elizabeth Wood,	6	Jan. 30, 1913,	Public school,	152 N. Sixth street,	Geisler.	
37	Mrs. Margaret Wood,	30	Feb. 6, 1913,	Housewife,	152 N. Sixth street,	Geisler,	32

Other Possible Sources of Infection.

The common sources of infection such as flies, ice, uncooked vegetables and fruits, ice cream, unsanitary conditions, and contact may be disposed of as follows:

This outbreak was confined to December and January and it is not necessary to consider flies as a source of infection because of the season of the year.

Ice cannot be regarded as a source of infection since it was used in only a very few of the households in which typhoid occurred.

Uncooked vegetables and fruits are undoubtedly used somewhat, but in a community the size of Connellsville it is almost impossible to draw any conclusions concerning their source. The limited spread of the epidemic also indicates that this source of infection played no important part.

Ice cream does not seem to demand consideration in this investigation. It was used by a few of those ill, but having been purchased and manufactured at numerous places there is nothing significant in its use.

Unsanitary conditions need not be considered since most of the households in which cases occurred had good sewer connections, were well located and clean.

Contact.

Contact seems to play a considerable part in the outbreak, it being possible to connect fourteen of the thirty-seven cases with previous cases.

On December 1st, 1912, Nicholas Hoye, an engineer on the Baltimore and Ohio Railroad, and residing at the Baltimore House, was taken sick with typhoid fever. He remained at the Baltimore House until December 30th when he was removed to Uniontown where he died January 17th, 1913. On December 12th, 1912, Raymond Murray, a fireman on the Baltimore and Ohio Railroad, working with Nicholas Hoye and also residing at the Baltimore House, was taken sick with typhoid fever. Four other cases of typhoid fever occurred in rather rapid succession in the Baltimore House, viz.—Mary O'Hara, child, December 15th; Thomas O'Hara, child, December 20th; Martin O'Hara, Jr., child, December 20th, and Pauline Verbosky, domestic, December 31st. The two cases having December 20th as the date of onset may be attributed either to contact or to infected milk, since they are included in the group of nine cases occurring in four successive days (December 18 to 21 inclusive), each of these cases being supplied with milk from the Geisler dairy. The O'Hara cases were children of Martin O'Hara, proprietor of the Baltimore House.

The other apparent primary case related to cases developing later was Mrs. Eleanor Ashe who was taken sick on December 5th, 1912. Two cases which were possibly contacts of this primary case were her husband, Harry Ashe, taken sick December 18th and her infant son, Thomas Ashe, whose date of onset was December 20th. The two latter cases are, however, a part of the group of nine persons, all consumers of milk from the Geisler dairy, who took sick between December 18th and December 21st inclusive. In addition, Harry Ashe was employed as a clerk in the Baltimore and Ohio Railroad Station, and although he had very little communication with any person in the railroad shops the possibility warrants the consideration of this case in connection with the other cases in the shops.

Three cases having direct communication with Nicholas Hoye, Raymond Murray and each other in the railroad shops are as follows: William Guthrie, storeroom clerk, December 18th, 1912; William Griffith, laborer, January 2nd, 1913, and Lloyd Cox, blacksmith, January 17th, 1913. None of these three cases had used milk supplied by the Geisler dairy. Three other cases, probably contacts, are Esther Guthrie, taken sick January 2nd, who was a sister of William Guthrie, and Raymond and Albert Griffith, sons of William Griffith, both taken sick on January 14th. None of these cases had been supplied with milk from the Geisler dairy.

One other possible contact case is Mrs. Margaret Wood, who was taken sick February 6th, 1913, after having nursed her two daughter, Helen and Elizabeth, who were taken sick with typhoid fever on January 26th and 30th, respectively. Mrs. Wood was also a user of milk from Geisler's dairy but since her date of onset does not fall into any of the group of cases considered heretofore as probably caused by Geisler milk it would seem more reasonable to attribute her infection to contact.

The following tables show the number of cases with respect to age, sex, occupation, attending physician, and disposal of sewage. The only significant feature is the number of Baltimore and Ohio Railroad employees some of whom were probably infected by contact.

Cases as to Age and Sex.

Age.	Male.	Female.	Total.
0- 4,	1	1	2
5- 9,	6	1	7
10-14,	4	2	6
15-19,	0	4	4
20-24,	6	3	9
25-29,	1	0	1
30-34,	1	1	2
35-39,	1	0	1
40-44,	1	0	1
45-49,	2	1	3
50-over,	1	0	1
Total,	24	13	37

Occupations.

Clerks,	7	(Baltimore and Ohio Railroad 2).
Housewives,	3	
Children,	3	
South Connellsville school,	3	
Parochial school,	3	
Second Ward school,	2	
Domestics,	2	
Retired,	1	
Machinist,	1	
Seventh street school,	1	
Fourth street school,	1	
Cokeworker,	1	
Teacher,	1	
Stenographer,	1	
Greenwood school,	1	
Locomotive engineer,	1	(Baltimore and Ohio Railroad).
Locomotive fireman,	1	(Baltimore and Ohio Railroad).
Blacksmith,	1	(Baltimore and Ohio Railroad).
Laborer,	1	(Baltimore and Ohio Railroad).
South Side school,	1	
At home,	1	
Total,	37	

Attending Physician.

Kerr,	8	Edmonds,	2
Baker,	5	Junk,	1
White,	5	Gallagher,	1
Churchill,	4	Colburn,	1
Francis,	3	Frantz,	1
Eckert,	2	Unknown,	2
Bell,	2	Total,	37

Disposal of Sewage.

Sewer connection,	24
Privy,	8
Both sewer connection and privy,	5
Total,	37

Conclusions.

The number of cases using milk supplied by the Geisler dairy and the fact of there having been typhoid fever on the premises of the dairy compared with the lack of evidence against any other possible source of primary infection seem reasons enough to warrant the statement that the infection of the Geisler milk supply was in a great measure the cause of the excessive typhoid in Connellsville and South Connellsville during December 1912 and January 1913.

The arrangement of the dates of onset as given on a table included in this report is not typical of an outbreak caused by an infected milk supply, but considering the fact that in the operation of this dairy no milk was mixed in the cans and that milk was distributed in large quantities to certain customers it is possible that only one or two cases were infected at first, possibly as many as nine in the second group about nineteen days later, and three in each of two rather indefinite groups occuring still later. Of the fourteen cases having been in contact with previously developed cases on such dates as to warrant the consideration of contact possible infection from the earlier cases eight were users of milk from the Geisler dairy, and of these eight four had dates of onset which are considered in the groups attributable to milk infection. This leaves but six of the entire thirty-seven cases investigated which are not attributable directly or indirectly to a specific cause. Considering all the evidence, the writer thinks that the outbreak was, in the main, due to infected milk supply and contact infection.

19. TYPHOID FEVER AT FRANKLIN, VENANGO COUNTY.

Thirty-eight cases of typhoid fever in the city of Franklin, Venango County, and six cases in the adjacent village of Rocky Grove in Sugar Creek Township were investigated during the early part of December of the current year by officers of this Department. The investigation was made in response to a request by telegraph from J. Howard Smiley, made December 1st upon his assuming the duty of City Commissioner of Franklin, in charge of public health and safety. Assistant Engineer William H. Ennis and Inspector Ira F. Zeigler arrived in Franklin the following morning.

The number of cases of typhoid fever occurring in Franklin City in the past eight years according to the reports made to the State Department of Health at Harrisburg by the local authorities in compliance with the State law are given in the following table. Franklin has an estimated population of 10,000. Its population was 9,767 in 1910 and 7,317 in 1900.

Franklin Typhoid Fever Cases Reported to the State Department of Health.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1906,	1	2	11	3	0	3	0	0	7	3	7	2	39
1907,	3	0	1	3	0	1	0	1	9	32	18	4	72
1908,	0	0	1	0	1	0	3	6	6	8	3	0	28
1909,	3	1	0	0	1	0	2	7	8	2	0	1	25
1910,	1	0	0	0	1	4	1	6	12	4	4	8	41
1911,	3	2	1	3	0	0	0	3	6	9	10	17	54
1912,	4	2	3	2	13	1	0	1	2	5	4	0	37
1913,	2	4	1	1	4	0	0	2	1	3	7	34	59

The outbreak of typhoid in the fall of 1907 was investigated by this Department in connection with the public water works and its auxiliary supply from French Creek was considered to have been the source of infection. Even before this there was local dissatisfaction with the French Creek source, which was considered responsible for the high typhoid rate. The agitation resulted in the introduction of a filter plant in 1908 after plans therefor had been approved by this Department. In 1909, the public water works system was purchased from the Venango Water Company by the city which has operated it from that time.

That part of the supply obtained from French Creek has continued to be a source of trouble even since the introduction of the filter plant which has not been maintained and operated up to modern standards of water purification practice. In the fall of 1911 and continuing through the winter and into the spring of 1912, there was an undue amount of typhoid in Franklin and, in June 1912, the Department conducted an efficiency test of the filter plant as a result of which a decree was issued to the city authorities advising them that an experienced engineer should be engaged to examine the plant and make recommendations for over-

hauling it and bringing it up to a proper standard of efficiency. The municipal authorities in charge of water works devised plans for remodeling details of the plant, underestimating, in all sincerity, the scope of the revision necessary.

A thorough investigation under the direction of the local authorities was later made by a consulting water works engineer, Mr. L. E. Chapin, and under date of October 26th, 1912, application was made to this Department for approval of plans for the remodeling of the filter plant. On November 18, 1912, a permit was issued to Franklin for the proposed changes subject to the following conditions and stipulations:

"*FIRST:* Approval is hereby given for the use of the high pressure water for washing until the summer of nineteen hundred and thirteen when a cheaper method should be adopted.

SECOND: The city shall forthwith make the improvements proposed by Mr. Chapin and herein and hereby approved under his skilled supervision or the responsible supervision of some other filter expert equally competent to render the services.

THIRD: The filter plant when improved shall be operated for six months under the responsible supervision of the expert who directs the making of the improvements and during this time the operators shall be instructed in proper filter plant operation and in the making of daily alkalinity determinations of the raw water.

FOURTH: The city shall keep daily records of the operation of the filter plant and water works system on blank forms satisfactory to the State Department of Health and copies thereof shall be filed in the State Department of Health at least monthly and more often if required.

FIFTH: Bacteriological analyses of the raw and of the filtered water shall be made by the city at intervals frequent enough to show whether the filter plant is being efficiently operated and copies of these tests shall be filed in the office of the State Department of Health.

SIXTH: If at any time in the opinion of the State Department of Health the water works system or the water supplied thereby or any part thereof has become prejudicial to public health, then such remedial measures shall be adopted by the city as the Commissioner of Health shall advise or approve."

The remodeling of the plant was completed in March 1913 under the supervision of the designing engineer in substantial accordance with the plans. The third stipulation of the permit, however, has not been complied with. The designing engineer has not had responsible supervision of the plant and the only supervision exercised has been by an operator of a filter plant at some little distance from Franklin. He makes weekly visits to collect samples for bacteriological analysis and to instruct the operators in the operation of the plant and the making of daily alkalinity tests of the creek water. This is not the close supervision which this Department intended the plant should have and which the interests of the public health demand. Further reference will be made to the bacteriological analyses.

That part of the public supply drawn from French Creek has continued unsatisfactory under these conditions, but this must not be considered prejudicial to filtration if properly supervised in accordance with best modern practice, the requirements of which the local authorities have failed fully to appreciate.

Punblic Water Works.

The pumping station is located near the south bank of French Creek about half a mile above Franklin.

The creek, following a general easterly course, passes through the town between the Third Ward to the north and the Second Ward to the south, bends to the south along the eastern side of the Second Ward and joins the Allegheny River opposite the northern end of the First Ward which stretches along the west bank of the lower part of the creek and the river south of the junction. The town, especially the older part, is pretty completely sewered upon the combined system to both the creek and the river. Comprehensive plans for the future are being prepared in accordance with permits and decrees issued by the State Department of Health. These decrees and those issued relative to the water works system and published in earlier reports of the Department described in detail the town and its water works and sewerage systems.

The low service water distributing district comprises the flats along the river and creek, including extensive manufacturing plants in the Third Ward along the creek and in the southern part of the First Ward, for Franklin is a manufacturing centre with good railroad facilities as well as the county seat of Venango County.

High service water distributing districts have been established, including the less closely built up residential districts on the hills north and south of the creek.

Gurney and Plummer Hills in the Second Ward are supplied by gravity from a system of enclosed springs and tanks from which the surplus overflows to the low service system.

Oak and Gardner Hills, north of the creek in the Third Ward, are supplied from a tank on Oak Hill which is fed by a force main direct from the pumping station. This system extends into Rocky Grove Village in Sugar Creek Town-

ship. The entire town can be put under the pressure of the Oak Hill tank. High up on Oak Hill thirty families are supplied from Stony Spring, the system having no connection with the rest of the town.

Bully Hill Spring serves about twenty-five dwellings in the southern extreme of the town and the surplus flows into the low service system.

In Cranberry Township across the river from Franklin is an entirely independent system supplying a few dwellings from a spring. These districts outside of the city were supplied by the Venango Water Company and since its purchase the city has maintained the service.

All of the springs are enclosed in masonry structures and well protected and there is no reason to suspect the supplies in connection with the typhoid fever in Franklin.

The main low service supply is furnished by a force main directly from the pumping station, where there are wells, beside the creek intake.

A dug well eight feet in diameter and thirty-five feet deep excavated through gravel to sand stone and walled up in cement masonry perforated for the entrance of ground water is located up stream from the pumping station and 250 feet from the bank of the creek. Down stream from the pumping station within a distance of 225 feet and 250 feet from the creek is a series of eight drilled wells sunk through thirty-six feet of gravel and forty feet of sandstone to shale. Suction pipes connect the drilled wells and the dug well to the pumping station.

The intake from French Creek is into a settling well eighteen feet square and quite deep, on the bank of the creek north of the pumping station. It is excavated to rock. There is a suction pipe from this well to the pump station and all water drawn from French Creek is filtered in the filtration plant adjacent to the pumping station.

The French Creek supply has been used regularly to augment the other sources only since the introduction of the filter plant as previously noted. There are four gravity rapid sand filters in wooden tubs fourteen feet nine and a half inches in diameter. There are also sedimentation tanks, and alum and lime are used to form a coagulant. The creek water is used because of the insufficiency of the well and spring supplies, at least under the present methods of operation.

There are three town service pumps all of which may be used for either the low service or the high service. It is customary to furnish a mixture of well and filtered creek water in the low service district and the high service district north of the creek. Water from the pump station can be furnished in part of the high service district south of the creek supplied by the springs, although this has not occurred in the past year.

The average daily consumption of water from the pumping station is 1,250,000 gallons and the maximum during summer months is 1,500,000 gallons. The pumping station records give the amount of water filtered during September, October and November 1913 as follows:

Month.	Week Ending.	Average Gallons Daily.
September,	6	1,000,000
	13	1,000,000
	20	900,000
	27	900,000
October,	4	920,000
	11	930,000
	18	900,000
	25	533,000
November,	1	225,000
	8	350,000
	15	350,000
	22	400,000
	29	450,000

French Creek Drainage Area.

French Creek above the pumping station has a drainage area of 1,400 square miles. Two miles above the Franklin intake is the Venango County Home with eighty inmates. The sewage is discharged into the creek without treatment. Twenty-eight miles above the intake is the city of Meadville, having a population of 13,000 and above Meadville are numerous other towns including Cambridge Springs of 1,500 population, Corry of 6,000 population, and Union City of 4,000 population. The sewage from these places is discharged into the creek. Conneaut Lake Borough, with a population of 1,000 is also within the drainage area and discharges sewage into a tributary stream. There are campers along the creek in season further menacing the purity of the waters.

Typhoid Fever Epidemic in 1913.

The Department's engineer and inspectors upon arriving in Franklin, in response to the call of City Commissioner Smiley, immediately advised the local authorities that the public be notified to boil all water to be used for domestic purposes and

also the milk. This was done by means of placards in conspicuous places and through the press. A preliminary analysis of the facts of the outbreak already known together with previous experience with the public water supply warranted the step as a preliminary emergency measure.

A chlorinated lime water disinfecting apparatus has been in operation for the treatment of the French Creek water in the suction pipe leading from the filtered water clear well to the pumps. It had been used off and on during the summer and in October up until some time in the week beginning October 19th, when the treatment was discontinued. On November 12th the plant was again started, using five pounds of chlorinated lime to the million gallons. Upon the arrival of the Department officers the dose of chemical was increased to about ten pounds to the million gallons of filtered water.

A thorough flushing of the water works piping system was effected through fire plugs and blow-offs in the evening of December 2nd. The public were advised through the local press to open and flush out all household spigots.

The milk dealers twenty-two in all, serving in Franklin and Rocky Grove obtained their supply from thirty-five dairies including those conducted by nine of the dealers. The dealers were interviewed and special investigations were made of a number of the dairies, but it could not be ascertained that there had recently been any typhoid or other intestinal disorder among any of the dealers or dairymen of their families or employees. The Department's County Medical Inspectors of the three counties, Venango, Mercer, and Crawford, in which the boroughs are located, were consulted and verified the information that there had not been typhoid fever at any of the dairies.

A census of thirty-eight cases of typhoid fever in Franklin and six in Rocky Grove Village was taken by the Department's officers, under the direction of Assistant Engineer Ennis, and his summary of the data collected is given in the following tables. The dates are of the onsets of the typhoid cases and therefore, the numbers disagree with the previous table of typhoid cases by months for the year, the reports for which were somewhat delayed. Up to the time of the departure of the Department officers on December 6th, only two of the cases in Franklin had proved fatal and none of those in Rocky Grove Village.

Typhoid Fever Cases in Franklin Census Taken by Department Officers.

	Date of Onset.	Age.	Sex.		Water Supply.			Milk Supply.
			M.	F.	City.	Well.	Spring.	
	1913.							
1.	Nov. 2,.....	5	M.	....	*	.....	.....	Wm. Hefferman.
2.	4,.....	7	....	F.	*	.....	.....	Brosana.
3.	5,.....	27	....	F.	*	.....	.....	Burkhard.
4.	8,.....	20	M.	....	*	.....	.....	Oak Grove Dairy.
5.	8,.....	8	M.	....	*	*	.....	Oak Grove Dairy.
6.	10,.....	17	M.	....	*	.....	.....	Wm. Teil.
7.	11,.....	29	M.	....	*	.....	*	Quinn.
8.	11,.....	22	....	F.	*	.....	.....	None.
9.	11,.....	12	M.	....	*	.....	.....	Condensed.
10.	11,.....	10	....	F.	*	.....	.....	Oak Grove Dairy.
11.	12,.....	25	M.	....	*	.....	.....	Graham.
12.	12,.....	11	....	F.	*	.....	.....	Nesbit.
13.	13,.....	10	....	F.	*	.....	*	Condensed and Limber Store.
14.	16,.....	11	....	F.	*	.....	.....	Ditzenberger and Brosana.
15.	17,.....	40	M.	....	*	.....	.....	None.
16.	17,.....	20	M.	....	*	.....	*	Bunnell.
17.	19,.....	31	...,	F.	*	.....	.....	Oak Grove Dairy.
18.	20,.....	9	....	F.	*	.....	.....	Ditzenberger and Condensed.
19.	20,.....	44	M.	....	*	.....	.....	Ditzenberger.
20.	20,.....	12	M.	....	*	.....	.....	Oak Grove Dairy.
21.	21,.....	21	....	F.	*	.....	.....	Burkhard.
22.	22,.....	3.5	M.	....	*	.....	.....	Oak Grove Dairy.
23.	22,.....	25	M.	...	*	.....	.....	Condensed.
24.	23,.....	14	....	F.	*	.....	.....	Burkhard.
25.	24,.....	23	....	F.	*	.....	.....	C. K. Hefferman.
26.	24,.....	7	....	F.	*	.....	.....	Oak Grove Dairy.
27.	24,.....	7	....	F.	*	.....	.....	Brosana.
28.	25,.....	9	....	F.	*	.....	.....	Brosana.
29.	26,.....	30	....	F.	*	.....	.....	Condensed.
30.	26,.....	13	M.	....	*	.....	*	Own Supply.
31.	26,.....	21	....	F.	*	.....	.....	Graham.
32.	26,.....	20	....	F.	*	.....	.....	Powers and Sigworth.
33.	Dec. 1,.....	41	M.	....	*	.....	*	Griffin.
34.	1,.....	21	M.	....	*	.....	.....	Ditzenberger.
35.	1,.....	31	....	F.	*	.....	.....	Griffin.
36.	1,.....	25	M.	....	*	.....	.....	Ewing's Store.
37.	5,.....	29	M.	....	*	.....	.....	Burkhard.
38.	6,.....	6	M.	....	*	.....	.....	W. R. Reise.

Occupation.

Children at School,	14	Bookkeeper,	1
Children at Home,	3	Plumber,	1
Women at Home,	8	Chemist,	1
Men at Home,	1	Stenographer,	1
Laborer,	6		
Banker,	2	Total,	38

Additional typhoid cases, five in all, one on December 1st, one December 4th, one December 20th, and two December 30th were subsequently reported to this Department, but not included in the census.

Typhoid Fever Cases in Rocky Grove Village. Census Taken by Department Officers.

	Date of Onset.	Age.	Sex.		Water Supply.			Milk Supply.
			M.	F.	City.	Well.	Spring.	
	1913.							
1.	Nov. 12,.....	27	M.	....	*	.....	*	Condensed.
2.	15,.....	52	M.	....	*	.....	.....	Oak Grove Dairy.
3.	18,.....	13	M.	....	*	.....	.....	J. Swatzler.
4.	19,.....	12	....	F.	*	*	.....	Boyer Battle.
5.	19,.....	6	....	F.	*	.....	.....	Condensed.
6.	19,.....	42	....	F.	.....	.....	*	Nesbit.

Occupation.

Childern at School,	3
Housewife,	1
Laborer,	2
Total,	6

Discussion.

That the public water supply furnished from French Creek was the source of this typhoid fever epidemic in Franklin is indicated pretty conclusively by a number of facts among the accompanying circumstances and data set forth in the foregoing census tables.

First, all of the cases in Franklin and Rocky Grove had used the public water supply prior to their illness, with the possible exception of the sixth case in Rocky Grove, who lived beyond the limits of the water district. This person claimed to have used no city water yet went regularly to the city and readily may have been infected indirectly from the public supply.

Second, the location of the typhoid cases was confined to the low parts of the first and second wards south of French Creek and the third ward including Oak Hill and to Rocky Grove Village in which districts the French Creek water was furnished.

Third, the bacteriological analyses of the French Creek supply show that complete purification of the water was not at all times accomplished by the filter plant and these results, which will be given later, are in accordance with what was to be expected in view of previous experience with the operation of the filter plant.

Fourth, the close succession of the cases and the comparative suddenness of the occurrence of the epidemic and its cessation indicated a medium of transmission of infection which must have been very generally distributed throughout the entire town at about the same time. This condition is fulfilled by the water supply.

Additional grounds for these conclusions lie in the fact that prior to the Franklin epidemic, there was typhoid fever present in the up-stream towns sewering into French Creek; and further in the fact that milk, the next most generally distributed article, is practically eliminated from the possibility of having been the primary source of infection. The typhoid fever cases were widely distributed among numerous milk dealers and no history could be found of previous typhoid among the milk dealers or dairymen.

Secondary infection within the family may have been responsible for four cases in Franklin, including one of the cases late in December reported after the Department's investigation. Secondary infection through the agency of some of the milk

dealers may have been responsible for a few cases prior to the Department's order to boil the milk for it is understood that proper emergency precautions were not enforced at that time.

French Creek from Meadville down to Franklin, during dry seasons is a successions of pools and shoals. The sewage thus is afforded opportunity for sedimentation and aeration. This, no doubt, accounts for lack of more evidence of sewage pollution in samples of raw creek water of which analyses appear later. However, with every disturbance of the flow of the stream following after a rain the sewage sediment is carried down to the Franklin intake.

The precipitation records of the United States Government gauging station near Franklin are given below:

Date. 1913.	Rainfall in inches.	Date. 1913.	Rainfall in inches.
Oct. 1,	.55	Nov. 4,	.08
2,	.10	8,	.25
3,	.80	9,	.71
12,	.58	10,	.92
13,	.05	11,	.03
18,	.25	12,	.06
19,	.10	13,	.28
20,	.41	14,	.38
21,	.84	15,	.05
22,	.03	16,	.06
23,	.05	19,	.04
24,	.37	20,	.13
25,	.63	23,	.08
26,	.38	24,	.02
28,	.03	26,	.07
30,	.05	28,	.05
31,	.15	29,	.19
		30,	.02
Total,	5.40	Total,	3.42

There were a number of heavy storms during October and the first part of November. The storms were more or less general throughout the drainage area. The flow of the creek fluctuated very much and with it the quality of the water. Heavy rainfall within the drainage area diluted the flow of the stream furnished by ground water storage and materially reduced its alkalinity.

These fluctuations in the flow of the creek and consequently in its turbidity and alkalinity demanded skilled supervision of the filtration plant, frequent tests of the water and the adjustment of the operation of its changing character. The plant at Franklin has not had the constant skilled supervision necessary.

Lack of such supervision at the time of the fluctuating conditions of the stream rendered the filtration inefficient at the very time when the scouring current was bringing down not only the continuous sewage discharges of the up-stream towns, but also the sewage deposits which had settled and accumulated in the quiet pools during the low water.

Not until October 26th had the accumulated effect of the storms materially reduced the alkalinity and increased the turbidity. Thereafter they fluctuated considerably until the middle of November. The onsets of the second and third typhoid cases in Franklin followed this first fluctuation, on October 26th, of the character of the creek water by nine and ten days respectively, about the minimum period for the incubation of typhoid germs in the body. These dates of onset are based upon reports of patients as to their first feeling sick. The first case, on the second of November, was not visited by the doctor until November 15th. Fifteen days after the first fluctuation in the quality of the water the epidemic was in full swing. The last considerable group of coincident onsets was on December first, about two weeks after the condition of the creek again became comparatively uniform.

The light doseage of chlorinated lime, five pounds to the million gallons, which was begun November 12, appears to have had no effect, or at least no immediate effect upon the epidemic. The falling off in the occurrence of new cases may have been partly due to the gradual permeation of the water in the tanks and the extremities of the piping system by the chemical, yet the principal factor in the interruption of the epidemic is believed to have been the change in the creek water itself, which occurred before the arrival of the Department's officers and before the dose of the hypochlorite was increased.

Bacteriological analyses of the public water and also of a number of private supplies, made by the Laboratory of the State Department of Health and also the bacteriological analyses of the public water supply, made by the City Bacteriologist are given in the following tables. It should be noted that the chlorinated lime, when used, was applied in the suction pipe leading from the clear well and would not effect the results of analyses of filter effluent and the clear well samples.

BACTERIOLOGICAL ANALYSES BY DEPARTMENT LABORATORY.

Collected by City Officer From Municipal Water Works.

Date Collected.	Source of Sample.	Bacteria per c. c.	B. Coli per c. c.
1913.			
September 2,	1. Raw French Creek,	12,000	0
	2. Effluent, filter No. 1,	1,200	3
	3. Clear well (filtered water),	5,400	0
	4. Tap, water works office,	4,000	0
	5. Spring,*	1,000	50
	6. Drilled well,	120	0
October 8, ...	7. Source not designated,	6,000	0
	8. Filter effluent,	10,000	0
	9. Clear well (filtered water),	6,000	0
	10. Tap, water works office,	3,600	0
	11. Spring (given above),	150	0
	12. Drilled well,	1,500	0
November 12,	13. Raw French Creek,	900	48
	14. Effluent, filter No. 2,	60	2
	15. Clear well (filtered water),	5	0
	16. Drilled well,	21	0
	17. Tap, water works office,	7	0

*This spring is on the hillside above the pumping station and has not been used since about the time when this sample was collected although previously it contributed at times to the public supply. It is not protected from surface wash.

Collected by Department Officers From Municipal Water Works.

Date Collected.	Source of Sample.	Bacteria per c. c.	B. Coli per c. c.
1913.			
December 3,	1. Collins Spring 2nd Ward High Service,	3	0
	2. Uniontown Road Spring, 2nd Ward high service,	10	0
	3. Tap, City Hall,	24	0
	4. Bully Hill Spring, 1st Ward,	160	0
	5. Drilled well, Pump Station (series of four),	17	0
	6. Raw French Creek pump station,	140	1
	7. Tap, R. G. Hall,	60	0
	8. Tap, Thos. Stewart, Rocky Grove,	180	0
	9. Tap, 228 Grant Street,	11	0
	10. Dug well, Pump Station,	16	0
	11. Filter No. 1, effluent,	150	1
	12. Filter No. 1, effluent,	150	2
	13. Raw, centre of French Creek at Pump Station,	140	0
	14. Mixed filtered and well water at pump,	11	0
	15. Tap, City Hall,	28	0
	16. Tap, 13th and Eagle Streets,	12	0
	17. Tap, 920 Buffalo Street,	28	0
	18. Tap, 837 Liberty Street,	20	0
	19. Tap, Park Hotel,	30	0
	20. Tap, Park Hotel,	60	0

Collected by Department Officers from Municipal Water Works—Continued.

Date Collected.	Source of Sample.	B. Coli per c. c.	B. Coli per c. c.
1913.			
December 5,	21. Dug well, Pump Station,	4	0
	22. Raw French Creek, Pump Station,	100	2
	23. Filter effluent,	24	0
	24. Mixed filtered and drilled well at pump,	32	0
	25. Spring above Pump Station (not used),	30	0
	26. Tap, Park Hotel,	24	0
December 9,	27. Raw French Creek, Pump Station,	175	12
	28. Filter No. 3, effluent,	2	0
	29. Mixed filtered and well water at pump,	4	0
	30. Drilled wells, Pump Station,	1	0
	31. Drilled wells, Pump Station,	2	0
	32. Water works office,	22	0

ANALYSES BY CITY BACTERIOLOGIST.

Date Collected.	Source of Sample.	Bacteria per c. c.	B. Coli per c. c.
1913.			
April 20,.....	1. Raw French Creek,	1,550	0
	2. Clear well (filtered water),	95	0
April 24,.....	3. Raw French Creek,	480	0
	4. Clear well,	300	0
May 7,.....	5. Raw French Creek,	3,200	5+
	6. Clear well,	140	0
May 15,.....	7. Raw French Creek,	3,000	104
	8. Clear well,	130	0
May 23,.....	9. Raw French Creek,	175	0
	10. Clear well,	60	0
May 29,.....	11. Raw French Creek,	2,700	104
	12. Clear well,	225	0
June 4, ...	13. Raw French Creek,	7,700	present.
	14. Clear well,	180	0
June 11, ...	15. Raw French Creek,	490	.....
	16. Clear well,	1,800	5+
June 22, ...	17. Raw French Creek,	1,500	+
	18. Clear well,	21	.....
	19. Tap, City Hall,	14	.....
July 1, ...	20. Raw French Creek,	1,840	+
	21. Clear well,	120	0
	22. Drilled well,	15	0
July 15,.....	23. Raw French Creek,	1,150	+
	24. Clear well,	33	.....
	25. Tap, City Hall,	69	.....
	26. Drilled wells,	3	0
August 5,....	27. Raw French reek,	290	+
	28. Clear well,	27	.....
	29. Tap, City Hall,	34	.....

ANALYSES BY CITY BACTERIOLOGIST—Continued.

Collected. Date	Source of Sample.	Bacteria per c. c.	Bacteria per c. c.
1913. September 9,	30. Raw French Creek,	480+	.....
	31. Clear well,	94	0
	32. Tap, City Hall,	28	0
September 30,	33. Raw French Creek,	490	+
	34. Clear well,	8	+
	35. Tap, City Hall,	13	0
October 24, ...	36. Raw French Creek,	3,400	3+
	37. Effluent filter,	2,000	+
	38. Clear well,	1,620	0
	39. Tap, City Hall,	850	.....
October 30, ...	40. Raw French Creek,	250	+
	41. Clear well,	6,000	.....
	42. Tap, City Hall,	890	.....
November 5,	43. Raw French Creek,	2,600	+
	44. Clear well,	480	+
	45. Tap, City Hall,	500	.....
December 4,	46. Raw French Creek,	4,900	+
	47. Tap Pump Station,	14	0
	48. Tap, City Hall,	22	0

BACTERIOLOGICAL ANALYSES BY DEPARTMENT LABORATORY.

Collected by Department Officers from Private Supplies.

Date Collected.	Source of Sample.	Bacteria per c. c.	B. Coli per c. c.
1913. December 3,	1. Dr. Wallace, drilled well,	24	0
	2. Soapstone Spring, near Sugar Grove Road,	13	0
	3. Galena Oil Co., drilled well,	3	0
	4. Broadhead Spring Bottling Works,	27	0
	5. Broadhead Spring, at bottling room,	5	0
	6. Leachgang Spring,	14	0
	7. Franklin Steel Works, drilled well,	2	0
	8. Galena Oil Co., Drilled well,	3	0
	9. Bowman Spring, Centre and Spring Streets,	32	0
	10. School, drilled well, Rocky Grove,	120	0
	11. N. Faller, drilled well,	600	0
	12. Fitzgerald, drilled well,	30	0

The city's bacteriological analyses, which were of course, more frequent than those made by the Department, show clearly the unsatisfactory character of the filtered water at the end of October and in the early part of November. No samples were sent to the Department's Laboratory during this period. However, the Department's analyses of the samples that were collected show that the filtered water was of unsatisfactory character on September second, October eighth, November twelfth and even as late as December third colon bacilli were found in filter effluent samples.

The private supplies are not shown to have been contaminated or open to suspicion as factors in the typhoid epidemic.

Conclusions.

The introduction of a filter plant to purify a public water supply without provision for its operation under skilled supervision, in accordance with the best modern engineering practice, may give the public a false sense of security and cannot be too severely condemned as a most unwise policy. No more forceful illustration of the disaster which may result could be asked for than this typhoid fever epidemic at Franklin.

The following decree was issued at the close of the Department's investigation:

"December 15th, 1913.

"To the Honorable the Mayor and Council,
City of Franklin, Venango County, Penna.

"Gentlemen:

* * * It is evident that the management of the purification works must be immediately placed on a different basis and I hereby and herein advise and request you to at once employ a competent water chemist and bacteriologist, skilled in the treatment and filtration of water, and place him in constant charge with resposible supervision over the operation. This expert should have nothing else to do; he should reside in Franklin, and be one of your permanent employees. You should fit up a laboratory for him and give him every necessary facility for the proper discharge of his duties.

"Furthermore, in order to put your plant on a more efficient basis, certain changes ought to be made.

"*FIRST.* With respect to the delivery of raw water to the sedimentation tanks. Your consulting engineer suggests, and we approve, that a raw water pump of smaller capacity than the pump now used for the purpose, be installed, and that it be operated at a rate equivalent to the rate of filtration during the time that the filters are operated, in order that there shall be a constant head maintained in the sedimentation basin.

"*SECOND:* The drainage facilities at the sedimentation tanks are not sufficient in capacity. To afford quick drainage a conical bottom should be placed in the tanks and the raw water should be applied at the surface and withdrawn from the surface.

"*THIRD:* The present rate controllers are not adapted to the station as it is operated. These should be substituted by rate controllers that can be rated to yield a predetermined quantity of filtrate at a uniform rate, regardless of the friction head in the filter unit. Furthermore, loss of head appliances, of some form adapted to the station, should be installed on each filter unit, and your consulting engineer should be instructed to devise simple and effective apparatus for this purpose.

"Furthermore, I beg to suggest, that there might be advantage enough to you in providing storage of raw water, or filtered water, in sufficient amount to enable you to shut down the filter plant during the period of a very bad water in French Creek, that now places a great burden on your filter plant, to warrant this subject being studied by your consulting engineer Therefore, you are requested to place the several matters in his hands and to prepare plans and reports to carry out these suggestions and submit them for approval to the Commissioner of Health, together with such other suggestions as may occur to him, in order that the plant may be brought up to a high state of efficiency.

"Yours truly,

"Samuel G. Dixon."

20. REPORT OF AN INSPECTION OF THE WATER SUPPLY RELATIVE TO AN OUTBREAK OF TYPHOID FEVER IN FULLERTON VILLAGE, LEHIGH COUNTY.*

There were seventeen cases of typhoid fever in this outbreak with dates of onset from September 12th to 25th, inclusive; fifteen were in Fullerton Village and two in West Catasauqua Village, both in the first class township of Whitehall, Lehigh County. Assistant Chief Medical Inspector, Dr. J. J. Mullowney, investigated the outbreak from a medical point of view at the end of September, as reported in another place, and on September 29th Assistant Engineer Wm. H. Ennis, and Inspector W. R. Teats were sent to Fullerton to investigate the engineering features and install a chemical dosing apparatus at the water company's sources of supply.

Typhoid Fever.

The investigation made by the Medical Division showed that sixteen of these cases as well as a few which occurred subsequent to the investigation were undoubtedly due to one of the milk supplies furnished from a dairy at which were found a sick girl and a convalescing attendant who milked the cows and handled the milk. Both of these patients were found upon examination, including positive Widal tests, to

*Another report of the outbreak may be found among the special reports of the Division of Medical Inspecton.

have had typhoid fever. The local health officials were notified and this milk supply was discontinued until the establishment of conditions under which it would not be prejudical to public health. The diagnosis of the seventeenth typhoid case was doubtful.

Public Water Supply.

The Clear Springs Water Company supplies 15,000 consumers in a number of small towns stretching along both banks of the Lehigh River for six miles above Allentown.

Since the outbreak of typhoid was restricted to this small district of an extensive water works system, this water supply could hardly be suspected as the source of infection or as having any bearing upon these cases. Nevertheless an investigation was made of the public water supply furnished by the Clear Springs Water Company, the sources of supply of which are more or less subject to pollution. Moreover, typhoid fever has constantly been present within the territory supplied by this company. A public water supply subject to pollution becomes unusually dangerous when typhoid fever from any source of infection develops in the community because of the chance that some one of the convalescing patients, still carrying the disease germs, may pollute one of the sources of the public supply.

Prior to the typhoid fever in Fullerton the State Department of Health had given consideration to the supply of the Clear Springs Water Company and on September 23, 1913, a decree had been issued to the company by the Commissioner of Health requiring certain things in order that the water supply might not be prejudicial to public health. The stipulations include the following:

"*FIRST:* Within fifteen days of receipt of this permit the water company shall install and put in operation the proposed hypochlorite of lime mixing and feeding apparatus as shown on the plan submitted with application, to treat all water supplied to the public from the impounding reservoir pending the construction of the proposed filtration plant. No unfiltered water from the Lehigh River shall be supplied to the public.

"*THIRD:* The proposed use of one of the high service pumps as a spare raw water pump is forbidden. No arrangement or connection shall be made whereby raw water can by-pass the filters at any time and enter the force main.

"*NINTH:* The water company shall make a regular monthly inspection and maintain an adequate patrol of the watersheds above its impounding reservoir and see that all reasonable precautions are taken to prevent any contamination whatsoever of the water supplied to the public. Any pollutions or cases of communicable disease shall be reported forthwith to the State Department of Health."

The water works system comprises an impounding reservoir on Spring Creek, a pumping station, an emergency intake in the Lehigh River, and a distributing reservoir and distributing system: also, the Leisenring Spring supply with an independent distributing system.

The drainage area of Spring Creek above the intake is three square miles of inhabited, cultivated land, supporting a population of 290 persons on forty-eight properties. In 1907 Department officers made a sanitary survey of the stream for the purpose of having pollutions abated. An investigation of the drainage area in connection with the precautionary measures relative to Fullerton showed that there were no pollutions of Spring Creek except a few which might be caused by wet weather. There had been no recent cases of typhoid fever on the drainage area.

Lehigh River water has been supplied by the Water Company at times when the creek supply had been turbid. The river supply was furnished from August 25th through the month of September because of the low stage of the creek and its consequent bad odor and taste.

The supply from the pumping station, whether drawn from the creek impounding reservoir or from the river, is raised through a ten inch force main to a three million gallon distributing reservoir on the Lincoln Heights. There is a by-pass at this reservoir from the ten inch force main to the sixteen inch supply main to the distributing system. The by-pass is only used when the reservoir is being cleaned.

The Leisenring Spring arises from the limestone formation to the west of the Village of Cementon which it supplies by gravity. This source was suspected in connection with a serious typhoid epidemic in Cementon in 1900. The spring has been protected from surface drainage by a concrete wall and is within an enclosure which is roofed over and kept locked. Moreover, a high board fence has been constructed around the property and outside of the fence a ditch has been constructed to keep surface drainage entirely away from the spring. Nevertheless, this source of supply must be kept under observation.

Bacteriological Analyses.

At the Laboratory of the Department, bacteriological analyses were made of samples collected by the Department officers during the Fullerton investigation from various parts of the system of the Clear Springs Water Company and from various

private supplies. Two of the samples showed some sewage pollution, such as might be expected in water from an inhabited drainage area like that of Spring Creek. The results of the analyses are given below:

BACTERIOLOGICAL ANALYSES BY THE DEPARTMENT LABORATORY.

Source of Samples.	Total Bacteria per c. c.	B. Coli per c. c.
Collected September 30, 1913.		
Lehigh River at intake,	35	0
Spring Creek in reservoir,	250	6
Tap, Cementon (Liesenring Spring),	60	0
Tap, Catasauqua (Municipal Supply),	2,000	0
Tap, Catasauqu (Clear Springs Supply),	7	0
October 1, 1913.		
Lehigh River opposite intake,	1,200	3
Tap, Northampton Borough,	16	0
Tap, Catasauqua,	18	0
Well, Lehigh Car Wheel and Axle Company,	700	0
Well, Graffin—Dairy Farm near Fullerton,	18	0
October 2, 1913.		
Tap, Catasauqua (Clear Springs Supply),	1	0
Lehigh River Intake,	12	0
Spring Creek in reservoir,	2,400	1
Distributing Reservoir,	7	0
Tap, Fullerton,	2	0
Tap Fullerton,	4	0
Tap, Fullerton,	32	0
Cistern, Asherbuss Dairy Farm, Hanover township,	360	1

Chemical Disinfection of the Water.

Apparatus for the disinfection of the supply obtained by the water company from the river and also for the Spring Creek supply when it should again be used, was installed under the direction of the Department engineer and the river water was treated with about eight pounds of chlorinated lime to the million gallons. It should be noted that the formal decree, quoted above, requires the establishment of this treatment permanently until the filtration plant is completed and put in operation which is expected to be early the coming year. Bacteriological analyses of the Leisenring Spring are required to be made by the water company and submitted to the State Department of Health at regular intervals and the same procedure is required relative to the operation of the filter plant when it is established.

21. EPIDEMIC OF TYPHOID FEVER AT JOHNSONBURG.

During January of the current year the citizens of Johnsonburg, Elk County, became alarmed by the prevalence of typhoid fever in the community and the State Department of Health was requested to make an investigation. Assistant Engineer, H. E. Moses was sent to Johnsonburg, January 31st, with Assistant Engineer Styer and Inspectors Zeigler, Morris, Rice and Falter. The public water supply was investigated in detail and also other conditions which might have a bearing on the presence of typhoid fever. The investigation was continued to February 6th. The report of Mr. Moses is given below.

General Conditions.

The borough of Johnsonburg is a manufacturing community of about 5,000 persons located in the valley of the Clarion River at the Fork of the East and West Branch thereof and is six miles north of Ridgway, the county seat of Elk County. Since 1890 it increased in population from 1,280 to 4,334 in 1910. It is an industrial town having a public water works and a sewerage system. The dominant concern is the

New York and Pennsylvania Paper Company which has two mills in the borough There are also the works of the Rolfe Tannery Company and the Johnsonburg Vitrified Brick Company, and several smaller concerns.

Johnsonburg is made up of four settlements namely, West Johnsonburg, Clarion Heights, East Johnsonburg, and the main part of the town. Adjacent to West Johnsonburg is the village of Rolfe in Ridgway Township.

West Johnsonburg lies in the fork of the Clarion River; Clarion Heights lies to the south of West Johnsonburg west of the river proper; East Johnsonburg is at the extreme southern border of the borough; the main part of the town comprises the business section lying east of the Clarion River and along the east branch of the river.

The main part of the town is publicly sewered. There are three outlets to the sewer system into the Clarion River. The system comprises three and a half miles of sewers mostly under fifteen inches in diameter. In the main part of the town where the sewers are located practically every important street has a sewer line. However, many dwellings on the line of the sewers are not connected with a sewer, owing principally to the expense incident to the connection with the sewer and the installation of modern plumbing facilities inside the buildings. This is true notwithstanding the fact that a borough ordinance requires dwellings along the line of a public sewer to be connected therewith. As a result of this state of affairs, privies in the back yards over loose earth vaults are quite common. Many of them are full to overflowing and storm water washes down the steep hillsides carrying with it a not inconsiderable amount of waste matter to be deposited on lower lying land or in streets. In a number of instances slops and wash water are poured into the street gutters. Taken all together, the borough is not a cleanly one and parts of it are in an insanitary condition.

Public Water Supply.

The public is supplied with water by the Johnsonburg Water Company said to be controlled by the New York and Pennsylvania Paper Company. The system was started in 1890 and has been extended from time to time and is now serving water in Johnsonburg and in the village of Rolfe. The water company has four sources of supply namely, Silver Creek, Powers Run, five drilled wells, and two springs, the last two mentioned sources being located along Powers Run in the southern end of the borough.

Silver Creek rises four miles and a half northwest of the borough in Johnsonburg Township and unites with the West Branch of the Clarion River at Rolfe. The water company has a dam and reservoir on this stream a mile and a half below its head waters above which point there is a water shed of about a thousand acres of uninhabited mountain land from which practically all of the virgin timber has removed. The reservoir is of irregular shape and has a storage capacity of 1,600,000 gallons. From it a ten inch gravity supply main leads to Johnsonburg and serves the lower lying sections of the town. Silver Creek becomes quite low in times of drought.

Powers Run drains a water shed of 6,400 acres for the most part similar to the Silver Creek water shed. At the extreme headwaters of the North Branch of this stream are thirteen small farms, a saw mill, and a hunting camp. An inspection of the properties was made on February 4, 1913, at which time twelve of the thirteen estates were occupied by forty-seven persons and there were eighty-one head of stock. In addition to the habitations the water shed is traversed by public highways. This inspection did not reveal any direct pollutions of the stream, but was not conclusive on this point because of the severity of the weather, everything being frozen.

About half a mile above the point when Powers Run joins the Clarion River, which is in the extreme southern portion of the borough, the water company maintains a pumping station and has thrown a dam across the run 1,100 feet up stream from the station and from here the water is diverted into a settling basin located alongside the pumping station. Between the diverting dam and the pumping station, the drilled wells and the two springs used as an auxiliary supply are located. The wells are each six inches in diameter, approximately a hundred feet deep, and discharge individually into the pond formed by the diverting dam, into the supply main therefrom, or into the settling basin at the pumping station.

The pumping station comprises two steam pumps and a pump driven by a gas engine. The total rated pumping capacity is 1,800 gallons a minute; each pump has its individual suction and discharge. These latter unite in a common force main outside of the pumping station, this extending up over the hill and terminating in a distributing reservoir at a high point in the town. A branch line from the force main extends around the base of the hill and connects with the distributing system in the main part of the town. From this source the entire town can be served but it is ordinarily used for the high service district, the low service district being served from Silver Creek.

A small supply is obtained from what are known as the Cemetery Springs, located on a hillside in the northern part of the town, walled in and protected, with a six inch supply main leading down into the town. From this source a few consumers are furnished.

The topographical features of the town and the location of the various reservoirs divide the system into high and low service districts. The Silver Creek water is used chiefly to supply Rolfe, West Johnsonburg, the paper mills (for drinking purposes), and a small portion of the main part of the town lying in the valley of the river. The balance of the territory is served from the Powers Run supply and in times of drought this supply is used for the entire water district. There are about 700 taps on the entire system divided almost equally between the high and low service districts. Thus it appears that possibly 3,000 persons out of a total population of 5,000 use the public water supply, this number being almost equally divided between the two sources. The remainder of the town's people are supplied with water from individual wells or from springs of the neighborhood. In some instances both the public supply and that obtained from a private source are made use of. The amount of water used from Silver Creek is unknown. From Powers Run the company pumps from 300,000 gallons to over 600,000 gallons daily, the pumps being operated usually from ten to sixteen hours a day. Almost all the water furnished by the water company is used for domestic purposes. That used in the paper mills for industrial purposes is obtained from the Clarion River and filtered in a filtration plant operated by the paper mill company.

History of Typhoid Fever in Johnsonburg.

Typhoid fever in Johnsonburg is abnormally frequent. It has been endemic for a number of years. In January 1906, the Chief Medical Inspector and the Chief Engineer of the Department of Health made an investigation in Johnsonburg to ascertain the cause of the continued prevalence of typhoid fever there and advise with the local authorities as to remedies. As a result of that investigation a report was prepared and published in the Annual Report for 1905-06. The following extract is taken from this report.

"In the fall of 1904 it is reported that over 50 cases of typhoid fever occurred in Johnsonburg. The exact figures are not known as the local health board reports are uncertain in exactness. More than one local physician has expressed the opinion that the number was at least 75. Prior to 1904 the disease is said to have been endemic. In the fall of 1905, or about the 1st of August, a canvass showed that 29 cases had developed within six weeks, also that an epidemic of dysentery, the extent of which could not be learned, but which was admitted to be large, had existed in the town for the same period.

"The location of the cases showed that while the poor and foreign elements living on the flats were most affected, the better class did not entirely escape. Practically all of the cases occurred in the district said to be supplied with water from Powers Run, or in the homes of those of the men who are employed in shops supplied by Powers Run, or the high pressure district.

"The low pressure or Silver Creek district of distribution, so far as the Department is able to judge from the meagre data at hand, has been quite free from typhoid. This district comprises about one-fourth of the town. It further appears from an investigation of the drainage area of Silver Creek, above the dam and reservoir, that the water shed is practically uninhabited and pollutions are not probable.

"An investigation of the drainage area of Powers Run in the summer of 1905 showed the first source of pollution to be about one mile above the water works pumping station. Here a settlement of ten houses existed whose privies, pig pens and barnyards are so located that the natural drainage, in some cases aided by springs which crop out near privies and pig pens, is direct to Powers Run. About two miles above the pumping station a virgin timber belt began and extended for several miles along the run and its tributaries. This belt was then the scene of lumber operations and several camps had been established along the banks of the run, each camp containing from 25 to 50 men, mostly foreigners, and in some cases women and children. The total number of men so engaged was variously estimated from four to eight hundred. It was also stated that sufficient timber existed there to provide employment for some of the men for four or five years.

"In camps occupied exclusively by men no privies were provided, and where such structures were found, they were located directly on the banks of the run.

"In one camp containing 22 men, it was ascertained that all had been affected with what was described as "bowel complaint," and that this sickness had lasted about a week, the cases occurring about four weeks previous to the outbreak of dysentery in Johnsonburg. The Department officers believe this was very probably the focus of infection.

"The matter of surface pollution of individual wells should be very thoroughly looked into by the local health board.

"The possible transmission over the surface of the ground of typhoid infection is illustrated in the case of a certain "Cooper" family, where five cases simultaneously developed. This family resided on the hillside. On the land above their residence, outside privies were maintained, although a sewer was available. During a cloudburst, the contents of these privies were flooded upon the property and into the cellar of the Cooper house. Members of the family actively engaged in removing the accumulation from the cellar. Typhoid had existed some months before in the

homes where the privy vaults were flooded and the contents washed into the Cooper cellar. Between ten and twelve days following the flooding, five members of the Cooper family were affected with typhoid.

"The situation in Johnsonburg from the standpoint of the interests of the public health, not only of the citizens of the borough but the public in general who may be affected through the various mediums of disease transmission from the focus of infection such as does now and will continue to exist in Johnsonburg until proper sanitary measures are intelligently and vigilantly enforced, calls for prolonged consideration, prudent conclusions and action.

"Typhoid fever and other water borne diseases are far above the normal rate. During the first 11 months of 1905 there have been 28 cases of typhoid fever reported. Diminution in this rate cannot be expected, but a very great increase is possible so long as sewage is improperly disposed of in the borough and the surface and ground water supplies used for drinking purposes are poisoned by pathogenic material."

At the time the investigation was made in 1906, lumbering operations were being carried on along Powers Run and there were numerous camps scattered over the watershed. Now the timber is cut off and these camps have been abandoned and to a very great extent the building removed. There yet remain on the watershed, however, the farms at the head waters of the stream as already noted.

From available records the following table, showing the cases of typhoid fever occurring in Johnsonburg has been compiled. It is certain that this does not represent the total number of such cases. The hospital at Ridgway receives numerous patients from Johnsonburg. It is known that in some instances at least, while reports of such cases may reach the Department, they are not definitely charged to Johnsonburg. Consequently, the following table shows a less number of cases of typhoid fever than actually occurred.

RECORD OF TYPHOID FEVER CASES IN JOHNSONBURG COMPILED FROM REPORTS TO THE STATE DEPARTMENT OF HEALTH.

Month.	Year.									
	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
January,	note (a)	note (b)	0	1	0	0	1	0	0	5
February,	.....	.....	0	1	1	2	0	0	0	1
March,	.....	.....	4	0	0	0	0	4	3	2
April,	.....	.....	8	4	0	0	0	0	7	1
May,	.....	.....	1	1	0	1	1	0	3	0
June,	.....	.....	0	0	0	1	0	0	0	0
July,	.....	.....	1	.....	4	2	0	0	0	0
August,	.....	.....	3	0	3	2	1	1	0	1
September,	.....	.....	5	5	4	3	1	3	0	0
October,	.....	.....	3	1	3	2	0	7	4	0
November,	.....	12	3	14	3	1	1	2	0	0
December,	.....	1	0	5	2	0	0	6	4	0
Total,	.....	.....	28	32	20	14	5	22	21	10

Note (a). In 1904 local reports indicate 75 cases. For this year there were not State Reports of morbidity.

Note (b). In 1905 a canvass (August 1), showed 29 cases in 6 weeks (also epidemic dysentery.)

It appears that in April 1912, the Department was notified by the County Medical Inspector of Elk County, that a considerable number of typhoid fever cases from Johnsonburg were being treated at the Ridgway Hospital. Acting on this information, a letter was addressed to the Johnsonburg Water Company by the Commissioner of Health ordering the company to make preparations to install a water treatment plant. The letter of the Commissioner and the reply of the water company are as follows:

"Johnsonburg Water Company, "April 29th, 1912.
"Johnsonburg, Pa.

"Gentlemen:—

"While your source of water supply to the public is derived from a sparsely populated watershed, nevertheless, the camps and the lumbering operations thereon constitute a menace to the public health that, in the opinion of this Department, makes it necessary that you should install a hypochlorite of lime treatment of the raw creek water before you furnish the water to the public. This treatment is comparatively inexpensive, less than $100 investment will suffice for the apparatus at the pumping station, and I hereby and herein request you to consult an expert and prepare plans and a report on the process and have the same installed at once, subject to the approval of this Department. A prompt reply is requested.

"Yours very truly,

"Samuel G. Dixon."

"Johnsonburg, Elk Co., May 4th, 1912.

"Mr. Samuel G. Dixon, M. D., Commissioner,
"Harrisburg, Pa.

"Dear Sir:—

"Replying to your letter of April 29th, I beg to inform you that all the camps, lumbering operations and everything else of this nature was removed from along our stream, namely, Powers' Run, over a year ago. We have a man who inspects this stream about three times a year. Upon his finding anything objectionable it is taken care of at once. Therefore, we do not think it necessary to install a hypochlorite of lime treatment.

"We will gladly send you samples of water, or if you prefer to send an inspector here we will gladly accompany him along this stream.

"We do not in any way wish to endanger any of our consumers' health.

"Yours truly,

"JOHNSONBURG WATER COMPANY,
"W. D. Clearwater,
"General Manager."

In view of these representations by the water company of the improved conditions along Powers Run and of its precautionary measures for the inspection of the stream and prevention of nuisances, the order for the installation of chemical treatment was not enforced.

Typhoid Fever Outbreak of 1912-1913.

In the latter part of January 1913, the Department was notified by a member of the local board of health that there was an undue amount of typhoid fever in the borough, enough to warrant an investigation and as a result an investigation of the situation was made by officers of the Department from January 31st to February 6th, 1913. It developed that from September 22, 1912, to January 25, 1913, twenty cases of typhoid fever had occurred in Johnsonburg and a complete census of these cases was secured for the purpose of ascertaining, if possible, the source of infection. Also a searching investigation was instituted as to the general sanitary conditions about the town and of the water supply with a view to determining the reason for the presence of endemic typhoid in this community. Detailed findings relative to onsets, age and sex, occupation, water supply, milk and other food supplies concerning each case were secured and these appear in the following tables:

ONSETS.		AGES AND SEX.				
	Total.	Age.	Male.	Female.	Total.	Class.
Sept. 22-1, ...						
" 23-1, ...	2	0-4, ..	.....	.....	.....	Infants.
Oct. 1-1, ...						
" 10-1, ...						
" 15-1, ...	3	5-9, ..	3	1	4	Children.
Nov. 1-1, ...	1					
		10-14,..	3	1	4	Minors.
Dec. 1-4, ...		15-19,..	4	.....	4	
" 2-1, ...						
" 10-1, ...						
" 15-1, ...	7	20-24,..	3	1	4	Of age.
		25-29,..	2	.....	2	
Jan. 1-1, ...						
" 5-1, ...						
" 9-1, ...		30-34,..	1	.....	1	
" 10-1, ...		35-39,..	.....	.....	.....	Mid-age.
" 17-1, ...		40-44,..	1	.....	1	
" 24-1, ...						
" 25-1, ...	7					
	20 in 5 mos.	Total,.	17	3	20	

OCCUPATION.	
	No. of Cases.
Teamster,	1
Student,	9
Merchant,	2
Housewife,	1
Painter,	1
Paper mill employee,	3
Laborer,	1
Machinist,	1
Carpenter,	1
Total,	20

MILK.	
Dealer.	No. of Cases.
Condensed,	2
John Ward,	7
Armstrong,	1
Stuedler,	1
Sargent,	2
Dorsey,	1
Harrison,	1
Reese,	2
Baker,	1
Batistie,	1
McAlee,	1
Total,	20
Other,	3

WATER SUPPLY.	
	No. of Cases.
City only,	10
City and Well,	6
City and spring,	3
City, well and spring,	1
Total,	20

MILK.			
	No. of Dealers.	No. of Cases.	Total.
City only,	1	7	7
City and Well,	3	2 each	6
City and spring,	7	1 each	7
	11		20

It being the winter season of the year flies are eliminated as a source of infection. Ice was used by only three of the patients and this was of the manufactured variety. Only three of the victims had used raw shell fish immediately prior to their illness. Seven of the patients had eaten ice cream secured from two local supplies. There is one well defined secondary case, two members of one household coming down with the disease. One of the other patients had visited in the home of a typhoid fever patient several weeks prior to his own onset.

A significant feature relative to typhoid fever in Johnsonburg is in the location of the cases included in the census. Only one case is in West Johnsonburg, three are in Clarion Heights, one in East Johnsonburg, and the remaining fifteen in the main part of the town. From the location, possibly three of the twenty cases may have secured water from the Silver Creek supply but the other cases are all located in the district supplied from Powers Run. It is reported that this is true of cases occurring in prior years, that in fact West Johnsonburg, supplied from Silver Creek, has been markedly free from typhoid fever.

From the record of the cases occurring in the seven year period from 1906 to 1912 inclusive, it appears that the borough has two distinct seasonal periods of typhoid fever, one in the spring of the year, reaching its maximum in April and the other in the fall of the year with its height around October and November. In other words, at the season of the year when rains are normally plentiful. It was pointed out in the report of 1906, that a danger existed in the method prevalent in the borough of disposing of sewage in privy vaults which might later overflow so that the filth would be washed down the hillsides to other properties. The facts already given point to this as a possible solution of the prevalence of typhoid fever in Johnsonburg. The cases have occurred sporadically but persistently from year to year.

Milk Supplies.

The milk supply in Johnsonburg was investigated by officers of the Department and it was ascertained that there are four principal dealers who serve milk to the public from wagons. There are several smaller dealers by whom the milk is carried from house to house and a considerable number of persons in the borough own their own cows and in many instances furnish a limited supply of milk to neighbors. It was not ascertained how many private supplies there were in the borough. About sixty customers are served from an ice cream store in the borough. Milk is served from the can by all of the dealers, bottles not being used at all. The following table sets forth facts relative to the principal dealers:

Name of Dealer	No. of Customers.	Approximate amount of milk handled daily.
John Ward (wagon), ...	55	100 quarts.
Urich Stuedler (wagon), ...	65	90 quarts.
Otto Dill (wagon), ...	40	85 quarts.
Otto Dill (wagon), ...	Johnsonburg Hotel.	15 quarts.
Otto Dill (wagon), ...	Mann's Confectionary.	20 quarts.
Andy Redmond (wagon), ...	25	28 quarts.
H. A. Tillack (wagon), ...	50	45 quarts.
John Dorsey (carried), ...	15	15 to 20 quarts.
Henry Stuedler (carried), ...	20	?
Alfred Benson (carried), ...	40	35 to 40 quarts.
L. G. Baker (ice cream store),	60	60 quarts.

The first five dealers, as set forth in the table, live in Ridgway Township outside the borough. The balance of the dealers are local men. An officer of the Department made a sanitary inspection at each of the dairy farms. Generally, the conditions at the farms were fair and milk was handled in a more or less sanitary manner. No record of typhoid fever on any of the dairy farms was found. Almost without exception, the dealers produce their own supplies. The marked exception is in the case of the Baker Ice Cream Store whose supply is procured from J. C. Dalrymple, Pittsfield, Warren County.

Ice Cream Supply.

The ice cream supply of the borough is handled chiefly by George Limber and L. G. Baker, both residents of Johnsonburg. The first dealer secures his supply from Warren and serves the brand known as I. X. L. About twenty gallons on the average is handled weekly at this establishment, most of which is sold at retail.

L. G. Baker manufactures ice cream and retails it at his store; he also sells it at a wholesale rate to three local dealers in the borough. Those thus served are Mrs. Frank Kreitzer, Frank Hudik, and Anthony Berak. About thirty-five to fifty gallons are sold daily. The product is made in the cellar of the store. Cream is procured from Frank Dill, Rasselas, Elk County, P. O. Wilcox, Pittsfield, Warren County, and the Butler Pure Milk Company of Butler. The utensils are handled in a sanitary manner, being scrubbed and scalded before using.

Precautionary Measures.

As a temporary safeguard while the investigation was going on, the water company, at the instigation and under the supervision of officers of the Department, installed a chlorinated lime dosing plant at the pumping station on Powers Run. This was put in service on the day these officers arrived and according to reports furnished by the water company has been operated continuously since that time, when this supply has been used. Orders were given that all water taken from Powers Run should be dosed with chlorinated lime until the water company was further advised. The entire question of water supply was carefully investigated. This included an inspection of the water sheds. The water distribution systems were flushed. Samples of the public and private water supplies were collected on five successive days. Notices advising the public to boil all water used for domestic purposes were inserted in the newspapers of the town.

As a result of the investigation, because it appeared that the most likely source of infection of the typhoid fever patients in Johnsonburg was the public water supply and because the Powers Run supply in any case must be looked upon with

suspicion, the Commissioner of Health issued on February 27th, 1913, to the Johnsonburg Water Company a decree relative to its water works system. The concluding portion of the decree is here quoted:

"As a result of this investigation into the conditions with respect to the public health and the water works system in said borough of Johnsonburg, it has been agreed and determined that the water works system will not be prejudicial to public health when certain things have been done, and I hereby decree that the said Johnsonburg Water Company shall do certain things as follows:

"*FIRST:* A detail plan of the water company's distributing reservoirs located in the borough shall be submitted to the Commissioner of Health for his approval on or before May first, Nineteen hundred and thirteen. Said plan shall show not only the layout of the reservoirs but also cross sectional elevations through the embankments in sufficient detail to enable the Department to judge of the stability of the structure; and it shall also show in detail the piping arrangements in and about the reservoirs, indicating particularly the respective elevations of the inlet and outlet pipes.

"*SECOND:* On or before May first, Nineteen hundred and thirteen, the water company shall submit to the Commissioner of Health for his approval, plans of a filtration plant in which all of the water taken from Powers Run is to be filtered. Particular attention must be paid to the design of the filter plant which must be operated whenever the pumps are operated and attain a high degree of efficiency. The water company should employ some qualified expert to select the best point for the erection of a filter plant and to design the details, as this will prove true economy.

"*THIRD:* Until the filter plant has been installed in accordance with plans approved by the Commissioner of Health, the water company shall continue the treatment of the water taken from Powers Run with chlorinated lime and shall keep daily records of the operation of the water works system, especially as relates to the operation of said treatment plant, and file a report of the same weekly in the office of the Commissioner of Health on blank forms satisfactory to the said Commissioner.

"*FOURTH:* The water company shall maintain a monthy patrol of the Silver Creek and Powers Run watersheds, observe whether the rules and regulations for the sanitary protection of the waters to be supplied to its patrons from Silver Creek and Powers Run are being complied with and promptly report the presence of any nuisance or menace. It shall keep a close supervision on any lumbering, wood-cutting or other operations on the watersheds, and as soon as a communicable disease appears the patrolman shall investigate and report to the State Department of Health. A report of the condition of the watersheds shall be made monthly to the Commissioner of Health."

The chlorinated lime treatment plant has been maintained in operation. The provisions for the filtration of the supply have been taken up by the water company officials in conference with the Commissioner of Health but the water company had not accomplished this needed improvement at the close of the year.

22. TYPHOID FEVER AT KUTZTOWN, BERKS COUNTY.

On June 28th a letter was received from Mr. Fred. T. Williamson, Secretary of the Board of Health of Kutztown a borough in the northeastern part of Berks County, with a population of 2,360 in 1910. The letter began as follows:

"Kutztown, Pa., June 27, 1913.

"Dr. Dixon,
"State Board of Health,
"Harrisburg, Pa.

"Dear Sir:—
"A serious outbreak of typhoid fever has occurred in Kutztown during the past few weeks and we are unable to locate the cause. Some claim it is due to contamination of the borough water supply while others think it comes from other sources * * * *."

The same evening Assistant Engineers C. H. Cummings and R. E. Irwin arrived in Kutztown under instructions to investigate the cause of the outbreak and take such emergency steps as the conditions might warrant. That night they met the Secretary and Health Officer of the Board of Health and went over such data as

had already been collected by the local authorities relative to the cases of typhoid and also commenced gathering a complete history of the cases at the houses of the patients. There were then nineteen cases.

The infection of a number of cases grouped in one district was attributed by the Board of Health to the William Kutz well, with good grounds for the assumption. This was a shallow, dug well lower than a large part of the town. The underlying formation is limestone which receives into its crevices a great deal of sewage from privy vaults and cesspools, there being no comprehensive sewerage system in the borough. It is no wonder the Kutz well and quite a few others about town were shown, by bacteriological analysis, to be polluted. The William Kutz well was closed and the other wells shown by analysis to be bad were either closed or placarded. The absence of an entirely satisfactory public water supply made it necessary to use good judgment before resorting to extreme measures. The Kutz well had been used by a great many families in the neighborhood. Some of the other wells, if used as generally, might have yielded just as many typhoid cases.

Warnings of the presence of the disease and of the need to boil all water and observe other precautionary measures had already been published in the newspapers by the local Board of Health. In addition, on June 27th, notices were posted conspicuously about the streets giving similar warnings. The local Board of Health placarded the typhoid fever properties, inspected them, and furnished disinfectants free of charge. They provided for the removal of refuse in the yards and alleys. The local Board of Health was directed to continue the warning relative to boiling water at frequent intervals so that the public would not become negligent and to require the milkmen to deliver milk to the houses where there were cases of typhoid, only by pouring it into receptacles provided therefor and not to be taken from the properties or touched by the milkmen.

Public Water Works.

The public water works, owned and operated by the Kutztown Water Company, was investigated the next morning, Sunday, July 29th. Although the entire outbreak could not be attributed to the public water, some of the scattered cases may well have been due to it. It was a factor of imminent danger demanding immediate attention.

The borough is located on Sacony Creek. The main pumping station is on the west bank of the creek nearly a mile down stream and north from the town. The several sources of supply are in the vicinity of the pump station. The main supply is drawn from Sacony Creek at the pumping station and raised into the distributing reservoir or by-passed around it into the town. The creek above the intake receives the discharges from a number of private sewers in Kutztown and from the gutters where wash water is discharged and also the copious flows of springs from the underlying, sewage laden limestone.

The Keystone State Normal School on high ground west of the borough at one time discharged its sewage by a sewer extending through the borough directly into the creek. This had been discontinued by order of the State Department of Health and the sewage is now discharged into cesspools on the school property.

The pollutions of Sacony Creek in the populous farming district along the eight miles of its course from the head waters and also in the borough of Kutztown have been inspected by officers of this Department and much has been accomplished in the abatement of these pollutions although adverse jury verdicts at variance with the facts as testified to by Department inspectors have been a serious handicap.

Kemps Run, a tributary to Sacony Creek from the east, furnishes part of the supply, considerable during wet weather but not more than one-tenth of the total during dry weather. Near the mouth of the run is a low intake dam and chamber from which a six inch pipe leads into a well at the pump station. The stream has a drainage area of three hundred acres of farm land containing fourteen habitations.

Several springs add a little to the supply. They are situated west of the creek in the little valley in the mouth of which the pump station is located. Here the formation appears to be slate. All but one of these springs dry up in the summer. They are not to be suspected in connection with the outbreak of typhoid.

These several sources are piped into a collecting well which connects with a pump well excavated in rock within the pumping station. There is also a valved pipe connection by means of which water from the collecting well may be turned into a small reservoir on the bank of the creek. From this reservoir a suction pipe leads about 2,000 feet down stream to a second pumping station.

There is reported to be a six inch drilled well about 700 feet deep in the bottom of the collecting well. There is no arrangement for raising water from this well, but it is reported that when the collecting well water level is kept several feet below the creek the drilled well furnishes a considerable flow of water.

The lower pump station, drawing from all the sources available at the upper steam power station, is operated by water power in an old grist mill. The back water in the creek above the dam extends to just beyond the upper pumping station. During wet weather this station furnishes by water power the greater part of the

supply, but during dry weather it can operate only a few hours at night. The force main extends to the upper pumping station whence a single force main extends to the distributing reservoir.

The pump operator, fireman and engineer in one, handled both stations, the upper steam power station in the daytime and the water power station at night, leaving his bed at least once to oil the pump.

The distributing reservoir is located on a summit between the pump station and the town. It has a capacity of 600,000 gallons at a depth of ten feet, sloping paved sides and is approximately square. The water in it is usually maintained at a level such as to provide a quantity only sufficient for fire protection and to cover daily inequalities in the demand. The distributing system extends throughout the built-up parts of the borough and to some consumers in Maxatawney Township. There were 451 connections August 8, 1913.

Emergency Measures at Water Works.

Mr. Peter D. Wanner, President and principal owner of the Water Company, was called on the telephone, Sunday, June 29th, at his home and office in Reading, and came to Kutztown that afternoon. After the Department officers had made plain the imminent danger of the situation,—typhoid fever in the town and the extreme liability of virulent germs reaching the creek and thus the water works intake, resulting in a wide spread epidemic following the scattered outbreak of typhoid.—Mr. Wanner took a very serious view of the matter and at once directed the company's superintendent at Kutztown to take all measures necessary to expedite the prompt installation of chlorinated lime disinfecting plants at the two pumping stations. He also promised to obtain first class apparatus to replace the emergency temporary installations. It was made plain to Mr. Wanner that a radical change would be necessary permanently to improve the supply.

Assistant Engineer, Irwin, was left in complete charge of the situation on June 30th, to supervise the disinfecting installations, complete the census of the typhoid cases, collect samples from the public system and private wells, and follow up any additional clues pointing to sources of infection. Assistant Engineer Styer was called to Kutztown to assist in this work. The following description of the outbreak with the incidental details is taken from Mr. Irwin's report.

Temporary chlorinated lime installations were made on June 30th under the direction of the Department officers. About ten pounds of chlorinated lime were used to the million gallons. The storage reservoir was then disinfected with copper sulphate, using about twelve pounds to the million gallons. Then as all the water entering the system was being disinfected the mains were thoroughly flushed about the town to remove any untreated water and to clear the mains of deposit. The water company was advised to procure orifice boxes for the feeding of chlorinated lime and at once the water company got in touch with those having such boxes for sale. There was trouble in securing the orifice boxes. One was secured and installed August 21st. This box was put in the upper pumping station.

An officer of the Department was at the pumping station a great part of the time from the first of July until August 20th over-seeing the treatment of the water. The reservoir was emptied and cleaned the latter part of July. Copper sulphate was used in cleansing the sides of the reservoir and to assist in preventing the further growth of algae.

The discontinuance of the lower pump station operation was required after the failure of the company to install its up-to-date disinfecting apparatus, with the alternative of placing an attendant in charge of the lower station at night.

A letter was sent the Board of Health stating that because surface drainage and wash water from the borough enter the stream above the water works intake the presence of typhoid fever within the borough called for special care on the part of the borough officials that those in charge of fever patients should be instructed regarding the necessity of using disinfectants. The officials were also notified that the disinfection of the water at the pumping station was being done by a temporary installation and as a precautionary measure and did not lessen the importance of impressing the public concerning the necessity of boiling the water used for domestic purposes.

The results of bacteriological analyses of samples collected from the Sacony Creek and Kemp's Run intakes, are as follows:

Sacony Creek Intake.

Date of Collection.	Location.	Bacteria per c. c.	B. Coli per c.c.
1913.			
June 29th,	Sacony Creek intake,	10,000	1
July 1st,	Sacony Creek intake,	27,000	0
July 2nd,	Sacony Creek intake,	32,000	1
July 9th,	Sacony Creek intake,	32,000	4
July 21st,	Sacony Creek intake,	1,500	8
July 22nd,	Sacony Creek intake,	350	0
July 24th,	Sacony Creek intake,	10,000	12
July 29th,	Sacony Creek intake,	16,200	0
August 4th,	Sacony Creek intake,	21,000	1
August 5th,	Sacony Creek intake,	27,000	0
August 7th,	Sacony Creek intake,	21,000	18
August 14th,	Sacony Creek intake,	21,000	30

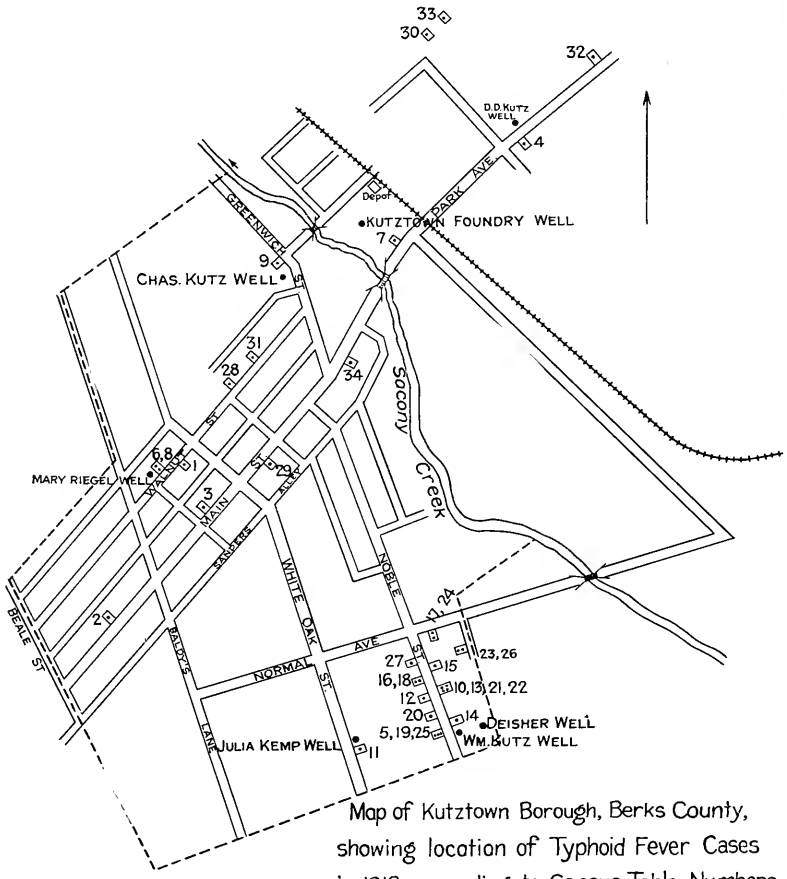
Kemp's Run Intake.

Date of Collection.	Location.	Bacteria per c. c.	B. Coli per c.c.
1913.			
June 29th,	Inlet to intake chamber,	10,000	4
June 29th,	Inlet to intake pipe, ..	6,500	6
July 1st,	Inlet to intake pipe, ..	4,500	24
July 2nd,	Inlet to intake pipe, ..	9,000	4
July 9th,	Inlet to intake pipe, ..	21,500	30
July 22nd,	Inlet to intake pipe, ..	720	21
July 24th,	Inlet to intake pipe, ..	480	10
July 29th,	Inlet to intake pipe, ..	65,000	0
August 4th,	Inlet to intake pipe, ..	5,400	20
August 5th,	Inlet to intake pipe, ..	10,500	2
August 14th,	Inlet to intake pipe, ..	800	21

Typhoid Fever Records.

The record of typhoid fever cases in Kutztown, reported to the State Department of Health by the local authorities, as required by law, is as follows; a zero represents a report of no cases and dash failure to report.

Month.	1906	1907	1908	1909	1910	1911	1912	1913
January,	—	—	—	—	0	1	0	0
February,	0	—	0	0	0	0	0	0
March,	—	—	0	0	0	0	0	0
April,	—	—	—	0	0	0	0	1
May,	—	—	—	0	0	2	0	7
June,	—	—	—	0	0	0	0	5
July,	—	—	1	0	0	0	2	8
August,	—	—	—	0	0	0	0	3
September,	—	—	0	0	2	0	1	0
October,	—	—	0	1	0	0	1	4
November,	—	—	—	0	0	1	0	1
December,	—	0	1	1	0	0	0	3
Total,	0	0	2	2	2	4	4	32



Map of Kutztown Borough, Berks County, showing location of Typhoid Fever Cases in 1913 according to Census Table Numbers and location of Wells Investigated.

Maxatawney Township, which wholly surrounds the borough, reports very little typhoid fever. No reports were submitted until 1910 when four cases were reported, one occurring in February and three in October. For 1911 one case was reported in the month of August. For 1912 four cases were reported in the month of February. To July 1st, 1913, one case was reported as occurring in June.

The following table gives the data collected by Department officers in the canvass made of all typhoid cases which had been reported in Kutztown in 1913 up to July 20th. Further on will be given a discussion of the cases which developed later in the year.

The accompanying sketch shows the location in Kutztown of the typhoid fever cases which occurred in 1913 and also of the private wells investigated in connection with the epidemic.

KUTZTOWN BOROUGH, BERKS COUNTY.

Typhoid Fever 1913 (First Series), January 1st to July 15th.

Number.	Name and Street.	Age.	Sex.	Occupation.	Onset.	Doctor.	Other cases in household.
1	Alvin Eckert, Walnut Street,	42	M.	Teamster,	April 19, ...	N. Z. Dunkelberger,	....
2	Mrs. Milton Kuhns, Main Street,	35	F.	Housewife,	April 28, ...	J. L. Peters,	....
3	Wm. Schick, Main Street,	28	M.	Foundry clerk,	May 1, ...	E. K. Steckel,	....
4	Alice Hertzog, Park Avenue,	27	F.	Housewife,	May 1, ...	N. Z. Dunkelberger,	....
5	Levi Hilbert, Noble Street,	56	M.	Farmer,	May 7, ...	N. Z. Dunkelberger,	1
6	Mrs. Laura Kerchner, Walnut Street,	25	F.	Housewife,	May 10, ...	J. L. Peters,	1
7	Emma Feick, Railroad Street,	15	F.	At home,	May 15, ...	E. L. Hottenstein,	....
8	Morris Kerchner, Walnut Street,	29	M.	Foundry,	May 17, ...	H. W. Saul,	1
9	Earl Stein, Greenwich Street,	11	M.	School,	May 20, ...	N. Z. Dunkelberger,	....
10	Howard Groff, Noble Street,	10	M.	School,	May 30, ...	N. Z. Dunkelberger,	3
11	Linwood Barto, White Oak Street,	8	M.	School,	June 1, ...	N. Z. Dunkelberger,	....
12	Mrs. Chas. Metz, Noble Street,	26	F.	Housewife,	June 2, ...	H. W. Saul,	....
13	Richard Groff, Noble Street,	35	M.	Carpenter,	June 5, ...	N. Z. Dunkelberger,	3
14	Dorothy Deisher, Noble Street,	11	F.	School,	June 9, ...	M. H. Koch,	....
15	Paul Metzer, Noble Street,	17	M.	Shirt factory,	June 14, ...	N. Z. Dunkelberger,	....
16	Charles Moyer, Noble Street,	16	M.	Foundry,	June 16, ...	M. H. Koch,	1
17	John Bleber, Noble Street,	21	M.	Foundry,	June 24, ...	H. W. Saul,	1
18	Fred Moyer, Noble Street,	40	M.	Foundry,	June 26, ...	M. H. Koch,	1
19	Mrs. Levi Hilbert, Noble Street,	54	F.	Housewife,	June 26, ...	N. Z. Dunkelberger,	1
20	Paul Hartman, Noble Street,	10	M.	School,	June 29, ...	M. H. Koch,	....
21	Vera Groff, Noble Street,	2	F.	Child,	July 4, ...	N. Z. Dunkelberger,	3
22	Elda Groff, Noble Street,	11	F.	School,	July 6, ...	N. Z. Dunkelberger,	3
23	Wm. Kohler, near Normal Avenue,	54	M.	Farmer,	July 12, ...	W. H. Saul,	....
24	George Bieber, Normal Avenue,	54	M.	Brickyard,	July 15, ...	W. H. Koch,	1

Number.	Water Supply.		Milk.	Ice Cream.	Ice.	Sewage Disposal.	Remarks.
	At Home.	At Work.					
1	Borough, ...	Borough and various,	Schwoyer and Weidler.	None, ...	None, ...	Privy, ...	Died May 4.
2	Borough, ...	Borough, ...	Oscar Well, ...	None, ...	Schenker, ...	Privy, ...	Died May 6.
3	Borough, ...	Foundry well, ...	Schwoyer, ...	None, ...	Schenker, ...	Privy, ...	
4	Borough and cistern,	Borough and cistern,	Schwoyer, ...	Mertz, ...	Rhode, ...	Privy, ...	
5	Borough and M. Dietrich well.	Borough, ...	Schwoyer and Weidler.	None, ...	None, ...	Privy, ...	
6	Dug well, ...	Dug well, ...	Schwoyer and Weidler.	None, ...	None, ...	Privy, ...	
7	Borough, ...	Borough, ...	Schwoyer, ...	None, ...	None, ...	Privy and cesspool,..	Died May 30.
8	Well, ...	Borough, ...	Schwoyer and Weidler.	None, ...	None, ...	Privy, ...	
9	Borough, ...	Borough, ...	Schwoyer, ...	None, ...	None, ...	Cesspool, ...	
10	Borough and W. Kutz well.	Borough, ...	Schwoyer, ...	Rheinharts, ...	Rhode, ...	Privy and cesspool,..	
11	Borough and Julia Kemp well.	Borough, ...	Schwoyer, ...	None, ...	None, ...	Privy, ...	
12	Borough and W. Kutz well.	Borough, ...	John Deisher, ...	None, ...	None, ...	Privy and cesspool,..	
13	Borough and W. Kutz well.	Borough, ...	Schwoyer and Weidler.	None, ...	Rhode, ...	Privy and cesspool,..	Died June 28.
14	Borough, ...	Deisher and W. Kutz wells.	Schwoyer, ...	Rheinharts, ...	Rhode, ...	Cesspool, ...	
15	Borough and W. Kutz well.	Borough, ...	Schwoyer, ...	Driekenmiller, ...	Rhode, ...	Privy, ...	
16	Borough and W. Kutz well.	Foundry well, ...	Weidler, ...	None, ...	Rhode, ...	Privy, ...	
17	Borough and W. Kutz well.	Foundry well, ...	Schwoyer, ...	None, ...	None, ...	Privy, ...	
18	Borough and W. Kutz well.	Foundry well, ...	Weidler, ...	None, ...	Rhode, ...	Privy, ...	
19	Borough and M. Dietrich well.	Borough, ...	Schwoyer and Weidler.	None, ...	None, ...	Privy, ...	
20	W. Kutz well, ...	Borough, ...	Schwoyer, ...	Rheinharts, ...	Rhode and Schenker,	Privy, ...	
21	Borough and W. Kutz well.	None, ...	Schwoyer and Beiber.	None, ...	Rhode, ...	Privy, ...	
22	Borough and W. Kutz well.	Borough, ...	Schwoyer and Beiber.	None, ...	Rhode, ...	Privy, ...	
23	Cistern and Deisher well.	W. Kutz and Deisher wells.	Schwoyer, ...	None, ...	None, ...	Privy, ...	
24	Borough and W. Kutz well.	Foundry well, ...	Schwoyer, ...	None, ...	None, ...	Privy, ...	

From the above table it will be seen that the age, sex, occupation, and the supply of ice and ice cream show nothing unusual. The absence of children assists in the elimination of milk as the cause. The cases were divided among practising physicians and there appeared no reason to doubt the diagnosis.

As Kutztown is a small borough there are but two milk dealers selling milk extensively. These two dealers are J. Schwoyer and Walter Weidler. Both sold from wagons and maintained milk depots in fair sanitary condition. Mr. Schwoyer had by far the greater number of customers, and as would be expected he supplied the greater number of typhoid fever patients. But little ice cream had been used. Also but few patients had used ice until after becoming sick. The ice furnished by Mr. Rhode was artificial.

The sanitary conditions on the properties where typhoid fever was found were good in almost every case. The patients were financially able in several cases to secure trained nurses and in others the usual precautionary measures were taken where the nursing was done by members of the household. It is probable, however, that there was some infection within the households. The second cases in the Hilbert and Bieber families and the third and fourth cases in the Groff family may be considered as contact cases. No evidence could be obtained showing that infection was carried from one house to another.

The first nine cases were scattered throughout the borough. The first case occurring in Noble street gives date of onset as May 7th. This is the only case on Noble street and in the vicinity that did not use water from the William Kutz well. After the ninth case with onset May 20th all of the cases with the exception of the eleventh, with onset June 1st, occurred in a small district on Noble street or on Normal avenue immediately off Noble street. All of these cases obtained water from the William Kutz well and in almost every instance also used the public water supply. As a whole twenty-one of the twenty-four cases used the borough water supply. Only three of these twenty-one cases used the borough water supply exclusively. One of the two cases using no borough water obtained her entire supply from a dug well. The other case used the Kutz well in connection with other well and cistern waters.

It is possible that the William Kutz well may have been infected during the early part of the typhoid fever outbreak and thereafter became the cause of the cases on Noble street and vicinity. The first two cases in July may be considered as infected by contact. The last two cases in July probably should be considered as occurring in June as they had not been well for sometime.

Individual Wells.

The William Kutz and Deisher wells are near the last two houses on the east side of Noble street, the last house being on the Kutz property. The Deisher well is a drilled well ninety-one feet deep and well protected. The results of three samples were satisfactory. This well had been used by several of the typhoid fever cases, but it is not suspected of being the cause of any disease.

The William Kutz well is a shallow dug well having a loose cover and in poor condition. The water from this well was considered of excellent quality and apparently was in use by almost the whole of the immediate neighborhood. It was believed by many to be the cause of the typhoid fever on Noble street and Normal avenue. All but one of the fever cases in this section used the water. Because of the evidence pointing to this well as the cause of the fever in this section it was closed. Samples were collected. One of the four samples showed the presence of B. Coli. Two of the other samples gave very high bacterial counts. Since the discontinuance of the William Kutz well typhoid fever has disappeared from the neighborhood. The Deisher well is being used instead of the Kutz well.

It is estimated that there are nearly one hundred individual wells in use within the water district. A few of these wells are used by the immediate neighborhood. It would appear that it is a custom among the inhabitants of this borough to carry water from neighboring wells for drinking purposes. Many of those having the public water supply in their houses thus carry water from wells, especially during the summer.

A well is located on Greenwich street adjoining the property of Charles Kutz and this well is designated as the Charles Kutz well. Because many persons carry water from this well samples were collected, and these showed the water to contain a large number of bacteria and B. Coli. Because of this the well was placarded and those interested in using the water are making an effort adequately to protect the well from surface drainage, and are installing a new pump. There is no reason to suspect this well as having been the general cause of the typhoid fever.

The well on the property of Mary Riegel, Walnut street, was sampled and as each of two samples showed the presence of B. Coli. the well was placarded.

The well at the foundry of the Kutztown Foundry and Machine Company was sampled because it was used as a drinking supply for several hundred men. Among these workmen three fever cases developed. This is a dug well, protected from surface drainage and from accidental contamination. The results from two samples proved satisfactory.

Samples were also collected from the wells on the property of Julia Kemp and D. D. Kutz. Because the Kutz well was found to contain B. Coli. in each of the two samples it was placarded. The sample from the Julia Kemp well showed the absence of B. Coli.

The results of the bacteriological analyses of samples collected from the individual wells and analyzed at the laboratories of the State Department of Health, are as follows:

Date of collection.	Name.	Bacteria per c. c.	B. Coli per c. c.
1913.			
June 29th	Deisher well,	80	0
July 1st	Deisher well,	2,500	0
July 2nd	Deisher well,	2,400	0
June 29th	William Kutz well,	600	0
July 2nd	William Kutz well,	10,000	0
August 8th	William Kutz well,	16,200	0
August 8th	William Kutz well,	1,200	3
July 2nd	Charles Kutz,	5,400	1
July 17th	Charles Kutz,	100	0
August 8th	Charles Kutz,	6,000	10
August 8th	Charles Kutz,	10,000	4
July 2nd	Mary Riegel well,	3,000	8
July 17th	Mary Riegel well,	210	21
July 2nd	Julia Kemp well,	700	0
July 2nd	Kutztown Foundry well,	650	0
August 8th	Kutztown Foundry well,	5,400	0
July 9th	D. D. Kutz well,	2,000	1
July 17th	D. D. Kutz well,	36	3

Discussion of Typhoid Outbreak.

The first nine cases of the outbreak and several subsequent ones appear reasonably attributable to the public water supply, as suggested in Mr. Irwin's report, though the sixth case is not shown positively to have used public water. The remainder of the twenty-four cases up to July 15th are attributable to the William Kutz well either directly or through secondary infection within the households. This seems entirely justifiable from the relatively large number of cases among the households using the William Kutz well, even though most of these cases used public water also.

Schwoyer's milk supply was furnished to all but a few of the typhoid fever patients. He supplied, however, most of the families in town and no reason was found to suspect the milk as a source of typhoid infection. The cases straggled through a considerable period, as would not have occurred in the case of the contamination of the entire milk supply, or even a single can. It has been customary in Kutztown to serve the milk from the can directly to the receptacle furnished by the customer, eliminating the possibility of house to house infection through the transfer of contaminated milk bottles.

The close proximity of many of the cases would naturally suggest that flies may have had a share in the transmission of infection. This possibility was carefully considered. A study of the dates of onset and of the general sanitary conditions of the afflicted households, as well as the relative position of the dwellings, led to the conclusion that it was not necessary to lay stress on this agency.

The typhoid fever in Kutztown abated for a period of two months from the middle of July. This was about two weeks after the people became thoroughly alarmed and the State Health officers had caused the establishment of disinfection of the public water supply and the people commenced to heed warnings to boil all water and avoid the use of the William Kutz well and other suspicious wells.

Two cases did develop within this time, the twenty-fifth and twenty-sixth cases of the year, respectively, on July 17th and August 3rd, but each of these cases as well as the twenty-fourth case, with onset of July 15th, more than two weeks after the first emergency steps, was in a household where there had been a previous case. Therefore, these cases, the only ones which developed in this time, are more reasonably charged to secondary infection than to the public water supply even though precautions were taken in the care of the previous patients in the households.

The disinfection of the public water supply was supervised by the State Department of Health until August 20th, as previously mentioned, then, the disinfecting plant in good working order, was turned over to the water company's operator

who had become familiar with the process. Nevertheless the temporary makeshift nature of this treatment was emphasized to the water company officials and the local municipal authorities, both personally and by correspondence from the Commissioner of Health. The need for boiling all water as the only adequate safeguard was emphasized again and again.

Second Typhoid Outbreak.

Notwithstanding these urgent warnings to the inhabitants of Kutztown and the water company officials, carelessness and laxity gradually developed as the situation seemed to improve.

Eight additional cases of typhoid fever developed after the departure of Mr. Irwin from Kutztown, from September 22nd to the close of 1913, bringing the total for the year up to thirty-four, although only thirty-two of these were formally reported to the State Department of Health at Harrisburg.

These last eight cases were all in houses in which typhoid had not occurred previously during the year. They cannot be attributed to private well waters, the milk supply or any other foods. The public water supply seems the only likely source of infection.

The following table gives a summary of the data collected by a Department officer relative to these cases toward the close of the year. They are plotted on the foregoing sketch by numbers consecutive to those of the earlier cases. The twenty-fifth and twenty-sixth cases rightly belong in the group previously discussed.

KUTZTOWN BOROUGH, BERKS COUNTY.

Typhoid Fever 1913 (Second Series), July 16th to December 31st.

No.	Name and Street.	Age.	Sex.	Occupation.	Onset.	Doctor.	Other Cases In House Hold.
25	Chas. Hilbert, Noble Street, ...	24	M.	Life Ins. Agent, ...	July 17	N. Z. Dunkelberger, ...	2
26	Annie Kohler, Normal Avenue, ..	18	F.	Teacher, ...	August 3	H. W. Saul, ...	1
27	Anna Rickenbach, Noble Street, ..	24	F.	Teacher, ...	September 22	N. Z. Dunkelberger, ...	
28	Robert S. Moyer, Walnut Street,	29	M.	Pool Room Attendant, ...	October 22	N. Z. Dunkelberger, ...	
29	Olive DeTurk, Main Street, ...	15	F.	School, ...	October 22	N. Z. Dunkelberger, ...	
30	Alvin Faust, Highland Avenue, ..	24	M.	Baker, ...	October 25	N. Z. Dunkelberger, ...	
31	Robert S. Welda, Jr., Walnut St.,	13	M.	Student, ...	November 3	N. Z. Dunkelberger, ...	
32	Geo. Fritz, Park Avenue, ...	30	M.	Shoe Cutter, ...	December 9	N. Z. Dunkelberger, ...	
33	Emma Reidenauer, Highland Ave.	52	F.	Housewife, ...	December 12	N. Z. Dunkelberger, ...	
34	James Neff, Main Street, ...	73	M.	Retired, ...	December 20	J. L. Peters, ...	

No.	Name and Street.	Water Supply.		Milk.	Ice Cream.	Ice.	Sewage Disposal
		At Home.	At Work.				
25	Chas. Hilbert, Noble Street, ...	Public, ...	Public, ...	Schwoyer, ...	None, ...	None, ...	Privy.
26	Annie Kohler, Normal Avenue, ..	Deisher & Kutz wells	Well, ...	Schwoyer, ...	None, ...	None, ...	Privy.
27	Anna Rickenbach, Noble Street, ..	Public, ...	Well, ...	Burk, ...	None, ...	None, ...	Privy.
28	Robert S. Moyer, Walnut Street, ..	Public, ...	Public, ...	Schwoyer & Weidler.	None, ...	None, ...	Privy.
29	Olive DeTurk, Main Street, ...	Public, ...	Normal School, ...	Schwoyer, ...	None, ...	None, ...	Cesspool.
30	Alvin Faust, Highland Avenue, ..	Public, ...	Public, ...	Burk, ...	None, ...	None, ...	Privy.
31	Robert S. Welda, Jr., Walnut St.,	Public, ...	Public, ...	Schwoyer, ...	None, ...	None, ...	Privy.
32	Geo. Fritz, Park Avenue, ...	Public, ...	Public, ...	Burk, ...	None, ...	None, ...	Privy.
33	Emma Reidenauer, Highland Ave.	Public, ...	Public, ...	Schwoyer, ...	None, ...	None, ...	Privy.
34	James Neff, Main Street, ...	Public, ...	.....	Schwoyer, ...	None, ...	None, ...	Privy.

Measures For Water Works Permanent Improvements.

Investigations of the public water works system from time to time by Department Assistant Engineers and the results of bacteriological analyses of samples collected during their investigations showed the laxity of the water company in operating the chlorinated lime disinfecting plant and the consequent irregular and unsatisfactory results of the treatment. The matter was taken up with the water company in the following letter:

"Peter Wanner, Pres., Kutztown Water Co., "November 12, 1913."
"622 Court St., Reading, Penn'a.

"Dear Sir:—

"It becomes my duty in the interests of the public health to notify and require you to forthwith engage the services of an engineer experienced in the treatment of water to undertake responsible supervision of your Kutztown plant and establish its operation in a manner so as not to be prejudicial to public health in so far as this can be accomplished immediately by emergency measures, such as the use of chemical germicides and cleaning the pipes, etc. The results of the bacteriological tests made of the water from time to time since the installation of the emergency chemical apparatus indicate that the operation is not being carried on with that faithfulness and regularity necessary to safeguard the public health.

"You are further hereby ordered and required, in order that your company may fulfill its obligations to the public, to have prepared and submit to this Department for approval on or before January 1st, 1914, plans and specifications and a report for a pure and adequate source of supply which will not be prejudicial to the public health and to be prepared to at once undertake the execution of the proposed plans after they are modified, amended or approved by this Department.

Very truly yours,

"SAMUEL G. DIXON."

Mr. Wanner called at the Department offices on December 10th to give assurance of the water company's intention to comply with the Department's requirements. On December 16th an engineer, engaged by the water company, called at the Department offices to go over the Department's requirements in a preliminary way and promised to submit plans early the following year.

23. TYPHOID FEVER IN NUREMBERG VILLAGE.

On August 21, 1913, a letter was received from Judge James C. Singley, a resident of Nuremberg, Schuylkill County, asking the help of this Department to investigate and check an outbreak of typhoid fever in that village. It developed subsequently that typhoid had been prevalent in the community since May, in which month six cases had their onset. In June and July each there were two cases. It is believed that the townspeople were aware of the spreading disease and probably had taken some precautions, but in August the number of cases increased so rapidly that the residents in Nuremberg became alarmed, with the result that a call for aid was made on the State Department of Health.

On the same day that this letter was received, the County Medical Inspector, Dr. L. T. Kennedy, of Pottsville, was instructed to go to Nuremberg and make an investigation, which he did on the day he received the instructions. On the following day, because of the seriousness of the situation as set forth in the telephone communication from Dr. Kennedy, officers of the Engineering Division were dispatched to Nuremberg with instructions carefully to investigate the outbreak. Assistant Engineer H. E. Moses with Assistant Engineer C. L. Siebert and Inspector James B. Aurand arrived in Nuremberg on August 23rd and conducted the investigation.

General Conditions.

The village of Nuremberg, also called New London, lies on the boundary line between Schuylkill and Luzerne Counties. The main portion of the town is in North Union Township, Schuylkill County, a small section extending over the county line into Black Creek Township, Luzerne County. The town lies on the southern slope of South Buck Mountain and drains into Tomhicken Creek, which is a tributary of the Catawissa Creek, this latter stream joining the North Branch of the Susquehanna River at the Borough of Catawissa. The nearest railroad station is at Fern Glen lying in the valley of Black Creek, half a mile over the mountain from Nuremberg. The Pennsylvania Railroad passes through Fern Glen Nuremberg is twelve miles west of Hazleton.

The village is supported mostly by the coal operations in Black Creek Valley on the other side of the mountain. There are no mines in the village. During the course of the epidemic an inspection of the town was made by officers of the Department by which it was ascertained that there are 170 properties, of which

number 38 are in Luzerne County and 132 in Schuylkill County. In this latter section 469 persons reside and in the former 137 persons live, a total of 606. For all practical purposes there is no dividing line through the village.

There are three main streets in the town, the principal of which is Mahanoy street lying wholly within Schuylkill County and along this thoroughfare stand the greater number of the buildings of the village. In the same county, at the east end of the village, a road leads off at right angles to Mahanoy street extending towards Mahanoy City and along this road about twenty properties are situated. The rest of the properties in the Schuylkill County section of the village are scattered on various other streets that branch from the main street. At the western or opposite end of the village Hazle street extends at right angles to Mahanoy street and passes over into Luzerne County leading toward Hazleton. Twenty-seven of the thirty-eight properties are strung out along Hazle street, the rest are scattered.

In the Luzerne County side of the village the inhabitants rely mostly on private wells connected with each property for their supply of water. Along the east side of Hazle street, about 500 feet from the county line, Gernhardt Spring is located at the foot of the mountain. This is fifty feet north of the Gernhardt residence. This spring is unprotected and is used considerably by persons residing in the neighborhood. In the Schuylkill County section of the village there are two semi-public water works systems. The larger of the two is known as the Breisch system, owned and operated by Theodore A. Breisch, a resident of the village. The source of supply is a six-inch drilled well ninety-eight feet deep with the casing driven two feet in the rock, here encountered fifty-five feet below the surface of the ground. The well is located just off of Mahanoy street on the slope of the mountain at the extreme eastern edge of the village. There are no buildings on the mountain side above the well. Water is raised by a pump at the rate of 300 gallons an hour to an elevated wooden tank, capacity 1,500 gallons, through an inch and a quarter force main. From the tank a three-quarter inch pipe supplies a three inch street main extending from the pumping station for 1,500 feet west in Mahanoy street. The daily consumption is said to amount to 1,500 gallons and there are thirty-two consumers, which includes four hotel properties, the remainder being residences.

The other semi-public supply in this section of the village is known as the Henry Lutz water works system for which the source of supply comprises two springs in the woods in the southwestern outskirts of the village. The springs issue from the slope of the mountain and there is one occupied property above them. The springs have been walled in and covered, but are not absolutely protected against intruders or surface drainage. From the springs a gravity line extends eastward to the Henry Lutz property, where a supply of water is furnished, and continues thence on to Mahanoy City road and here supplies five properties.

In this same section of the town there is a spring used considerably by the public, known as the Moses Sherman spring, located in the northeastern part of the village about 500 feet north of Mahanoy street. A considerable portion of the town lies above this spring and there is a remote possibility of surface drainage polluting it.

All of the above semi-public and spring supplies have been sampled by the Department and the results of the analyses will be set forth later.

Nuremberg does not have a public sewer system. By the inspection of the village it was ascertained that there were no direct stream pollutions, but nuisances were discovered. Of the 170 properties inspected fifty-one were found to be in a satisfactory condition and 119 unsatisfactory. On these, 307 nuisances were found and 118 notices of abatement have been served, one nuisance being abated without serving a notice. Of the nuisances found eighty-five were by privies and ninety-eight of kitchen and laundry wastes.

Typhoid Fever Outbreak.

For the first four months of 1913 there were no typhoid cases in Nuremberg. During the next four months there were a total of twenty-two cases, twelve of these occurring during August. In the last third of the year there were four cases, making a total of twenty-six cases for the year. The Department's investigation occurred the latter part of August, the officers not arriving on the scene until the epidemic had practically abated, so far as the onset of new cases is concerned. All cases, however, that had occurred in the village or the immediate vicinity during the summer were studied, a total of twenty-two cases being made the subject of a thorough investigation and the period thus covered extending from May to August, inclusive.

According to the onsets, there were six cases in May, two in June, two in July, and twelve in August, a total for the period of twenty-two. All but three of these were in the village, these three living on separate farms in North Union Township, about one mile south of Nuremberg, and in each instance the case had some connection with the village. The following table shows the cases by months for the entire year:

Onsets By Days.

Day.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1,	....	....	....	....	....	....	....	1	....	....	....	....	....
2,	....	....	....	....	....	....	....	2	....	....	....	....	....
3,	....	....	....	....	....	....	....	....	....	....	....	....	....
4,	....	....	....	....	....	....	1	....	....	....	....	....	....
5,	....	....	....	....	....	....	....	....	....	....	....	....	....
6,	....	....	....	....	....	....	....	....	....	....	....	....	....
7,	....	....	....	....	....	....	....	....	....	....	....	....	....
8,	....	....	....	....	....	....	....	....	....	....	....	....	....
9,	....	....	....	....	1	....	....	1	....	....	....	....	....
10,	....	....	....	....	1	....	....	1	....	....	....	....	....
11,	....	....	....	....	1	....	....	1	....	....	....	....	....
12,	....	....	....	....	....	....	....	....	....	....	....	....	....
13,	....	....	....	....	....	....	....	....	....	....	....	....	....
14,	....	....	....	....	....	....	....	....	....	....	....	....	....
15,	....	....	....	....	1	....	....	....	....	....	....	....	....
16,	....	....	....	....	1	....	....	....	....	....	....	....	....
17,	....	....	....	....	....	1	....	2	....	....	....	....	....
18,	....	....	....	....	....	....	....	1	....	....	....	....	....
19,	....	....	....	....	....	....	....	....	....	....	....	....	....
20,	....	....	....	....	....	1	....	1	....	....	....	....	....
21,	....	....	....	....	1	....	....	....	....	....	....	....	....
22,	....	....	....	....	....	....	....	1	....	....	....	....	....
23,	....	....	....	....	....	....	....	1	....	....	....	....	....
24,	....	....	....	....	....	....	1	....	....	....	....	....	....
25,	....	....	....	....	....	....	....	....	....	....	....	....	....
26,	....	....	....	....	....	....	....	....	....	....	....	....	....
27,	....	....	....	....	....	....	....	....	....	....	....	....	....
28,	....	....	....	....	....	....	....	....	....	....	....	....	....
29,	....	....	....	....	....	....	....	....	....	....	....	....	....
30,	....	....	....	....	....	....	....	....	....	....	....	....	....
31,	....	....	....	....	....	....	....	....	....	....	....	....	....
Total,	0	0	0	0	6	2	2	12	*1	*2	*1	0	26

*These four cases were reported to the Department subsequently to the investigation and the exact time of onset was not given.

By the above table it is seen that the outbreak reached its height in August, over forty-six per cent. of the entire number of cases for the whole year occurring in this month.

In the homes affected there was a total population of 161 with twenty-two cases of typhoid fever. Thus nearly fourteen per cent. of the entire population of these households was affected. In two of the households there were two cases each and in one other household three cases, with fifteen households having but one case each. Below are shown statistics relating to morbidity and mortality:

Morbidity.

Total pop. in Households Affected.	Number Cases.	Per cent. Affected.
161	22	14

Mortality.

Total Cases.	Deaths.	Per cent. Deaths.
22	2	9

Of the twenty-two cases twenty fall in the age period from five to thirty. No infants nor persons over fifty years of age were ill. Two of the cases fall into the age period from thirty-five to forty-five. Below are shown in detail the facts relative to the age and sex of the patients:

Age and Sex.

Age Period.	Male.	Female.	Total.	Classification.	
0- 4,	0	0	0	Infants,	0
5- 9,	1	3	4	Children,	4
10-14,	5	1	6	Minors,	9
15-19,	2	1	3		
20-24,	3	1	4	Of age,	7
25-29,	2	1	3		
30-34,	0	0	0		
35-39,	1	0	1	Middle age,	2
40-44,	1	0	1		
45-49,	0	0	0		
50 and over,	0	0	0	Old age,	0
Total,	15	7	22	Total,	22

As to occupation it appears that fourteen of the cases may be considered as stay-at-homes. This includes ten students, three persons engaged in housework and one child. The rest of the patients, eight in number, were engaged in various occupations that took them away from their homes more or less. The greatest number in any particular class is the group of ten students. All except one of these attended the Nuremberg School, the exception being a scholar in one of the township schools outside of the village. A survey of the dates of onset of these patients, however, reveals the fact that four of them came down with the disease in May while school was in session, with two in July and four in August during the vacation period. Consequently, it appears that the question of contact at school has no particular significance. The occupations of the various patients is shown below:

Occupations of Typhoid Fever Patients.

Classification.	Cases.
Student,	10
Miner,	4
Housewife, } Housework, }	2
Hotel proprietor,	1
At home,	1
Domestic,	1
Laborer,	1
Powder works superintendent,	1
Carpenter,	1
Total,	22

The use of raw shell fish is eliminated as a possible source of infection because of the season of the year. Only one of the patients had eaten oysters within thirty days of his onset.

Of the twenty-two cases fourteen had used no ice, six obtained their supply from one dealer and two from another dealer. The supply to the six was obtained from a small pond on a dairy farm about one mile south of the village. This pond is fed by springs. The supply furnished the other two is cut from an ice pond on Tomhicken Creek about half a mile south of Nuremberg. The watershed above the pond is inhabited, the village of Nuremberg and the village of Weston being located thereon. At Nuremberg there were no direct pollutions of this stream discovered. The creek flows directly through the village of Weston and here 523 persons reside. One hundred and twenty properties were inspected and eighty unsatisfactory ones were found on which 125 nuisances existed. In consideration of the extent of the supply of ice to other persons in the village it cannot be concluded that the ice had any particular bearing on the infection of these patients, both supplies being quite generally used by the villagers.

The ice cream supply in the village was investigated. The principal dispenser of this product, H. B., has a grocery store in the village and for the past eighteen years has handled ice cream in connection therewith. He sells from eighteen to twenty gallons a week from May to September, inclusive. The supply is purchased of G. O. Praetorius, of Hazleton, shipped to Fern Glen by rail and thence by wagon to Nuremberg. The trade is largely a retail one. Care is apparently exercised in the handling of this commodity at the store. The water supply at the store is furnished from the Breisch system and all utensils made use of in handling the ice cream are thoroughly scalded and cleansed. Of the twenty-two cases of fever eight had used no ice cream, eleven had bought from the supply just described, and the other three had used various supplies. There is no record of any typhoid fever in the homes of any of the venders of ice cream in Nuremberg.

There are three significant features of this outbreak, namely, the grouping of the cases with the possibility of the transmission of infection through the medium of flies; the milk supply, with a chance of infection through a typhoid fever carrier and a prior case of typhoid fever; and the water supply, connected with which is the question of the general sanitary conditions in the village. These three points will be considered *seriatim*.

Case Grouping. There are two distinct groups of cases, for the sake of convenience designated as groups A and B. Group A comprises four cases lying in the southern part of the town along the Mahanoy City road. Here three households were affected, all on the east side of the road and near one another. The distance included by the three is not over three hundred feet. There is a house intervening between each case and the one next to it. The fourth case is on the opposite side of the roadway just across from the middle of the three cases. This latter case has no particular bearing on the group, it being the case of a girl who was employed as a domestic in a hotel on Mahanoy street, in the group B district. In this same hotel there was another case with an earlier onset. Eliminating the case of this domestic leaves three cases in group A: two are brothers residing in separate houses and the third an intimate companion and fellow workman with one of the other cases. The first case is that of a boy fourteen years old whose onset is given as May 10th; the second house from him is the home of his brother twenty years of age, a miner, with onset on May 11th, and two houses beyond this man is his fellow workman, also a miner, onset on May 15th. The two miners visited Hazleton occasionally and each had been ailing for some time before the onsets actually given. One of these men is reported as having been ill for at least thirty days prior to his determined onset. This arouses a doubt as to the actual onset and it is thought that possibly one of the cases may have infected the other two in some manner, as they were together almost constantly, or possibly two of the cases may have been primary with a third secondary.

In group B there are ten cases, nine of which resided along Mahanoy street about the centre of the village within a distance of five hundred feet. The tenth case, about three weeks before his onset, moved from a house on Mahanoy street near the other cases to a side street two hundred feet away. In this group there are three cases in one house, one of which is secondary, two cases in another house, one being secondary, and the remaining five in as many separate houses. To this group must be added the case referred to in the discussion of group A, being that of the domestic who worked in the hotel where a case with an earlier onset was being nursed. The onsets of the eleven cases are as follows:

Case No.	Onset.	Remarks.
5	May 21	
6	June 17	
9	July 24	
10	Aug. 1	
11	Aug. 3	
12	Aug. 3	
13	Aug. 10	Secondary (?)
14	Aug. 11	
17	Aug. 17	Secondary.
18	Aug. 22	Imported.
20	Aug. 23	Secondary.

From the above it appears that possibly three of the cases may have been secondary and one imported, leaving seven with undertermined origins. It will be noted that most of the cases occurred during the warm months.

The remainder of the cases, eight in number, are not grouped. One is in the village along Hazle street in the Luzerne County section, this being the case of a boy, a laborer, who worked outside the village and who had been taken to the Hazleton Hospital for an appendicitis operation. While there it developed that he had typhoid fever. The origin of his infection is unknown. He is the only case in the Luzerne County section of the village. Two of the other scattered cases were in one household and one was the case of a mother who nursed her son ill with typhoid fever and she is probably a secondary. One of the remaining cases is of unknown origin. In reference to remaining one, a man twenty years old, the mother in this household in February had had symptoms of typhoid fever but

the case was not positively diagnosed at that time. Later in September a blood specimen from this woman was positive to the Widal test, so that she probably infected the boy.

The three remaining cases are located on farms about one mile south of Nuremberg with onsets May 9th, August 9th, and August 26th. There seems to be no direct connection between the three cases; two were school children, one attending the Nuremberg School, and the other a boy, attending a township school outside of the village. It is reported that this boy associated and played with one of the boys residing in the village during his convalescence from typhoid fever so that his may be a contact case. The third case in the country is that of a carpenter working at his trade for most of the summer in the village of Nuremberg. No cause of infection has been traced in this case.

Flies. Taking into consideration the grouping of the cases and, particularly as relates to those in group B, the dates of onset there is some reason to believe that possibly the infection may have been spread during the summer months through the medium of flies. The town has no public sewer system or public method of garbage disposal and many nuisances and instances of unsanitary conditions were discovered by the Department officers. This theory cannot be proved absolutely but it is based on the existing conditions and is offered as a possible solution of the spread of the infection.

Milk Supply. For the past twenty years the principal milk supply of the village of Nuremberg is from the dairy farm of C. B., about one mile south of the village. This supply also is the principal one in the villages of Fern Glen, Derringer, and Gowen, which three villages are in the valley of Black Creek on the opposite side of the mountain from Nuremberg. There is an average daily sale of 120 quarts of milk, distributed by this dairyman about as shown in the following table:

Name of Village.	Customers.	Amount Sold.
Nuremberg,	60	85 quarts
Fern Glen,	14	16 quarts
Derringer,	6	6 quarts
Gowen,	9	9 quarts
Total,	89	116 quarts

In the above are included four hotels in Nuremberg, each supplied with, on an average, one quart daily; the store of F. F. Derr with four quarts daily, used for milk shakes, and the bakery of Charles Zimmerman with two quarts daily, also used for milk shakes. The remainder are residence customers.

On the dairy farm there are twenty-three head of cattle and at times a maximum of 160 quarts of milk is produced. An investigation of the premises showed them to be in good condition and it was evident that care was exercised in the production and delivery of the milk, the can trade being in vogue. Occasionally in case of shortage, a small amount of milk is purchased from neighbors of this dairyman.

Five of the cases investigated used this supply wholly and five others used it in connection with an additional supply. Considering the number of persons served from this dairy, no suspicion can justly be attached to this milk supply. There is no record of any cases of typhoid fever occurring along this milk route in the other villages served.

Milk is also furnished in the village to a few residents by Dairyman T., but only three cases of typhoid fever had been using this supply. On the outskirts of the town is the farm of H. L.; here four cows are kept. On an average fifteen quarts of milk a day are obtained, some of which is sold. There are five regular customers and from six to ten occasional customers. The milk is prepared by the wife and one of the daughters of this farmer and, because of certain facts, the attention of the Department was directed to this latter person. It appears that about May 30th this girl was taken sick with symptoms somewhat indicative of typhoid fever, although a positive diagnosis was not made. The illness was of about two weeks' duration and it is reported that the impression prevailed that the girl had typhoid fever. Among the families served wholly from this milk supply there were four cases of typhoid fever, two of which had onsets in the early part of May and the other two occurring in August. But this supply was also used occasionally in four other households where typhoid cases occurred only one of which had an onset in May, all the rest being later. It was thought that possibly this girl might be a carrier and in handling the milk be the cause of infecting this food supply. Orders were given that she should discontinue the handling of milk until a determination of this point was made. Efforts were made to secure a Widal or a sample of feces from this girl, but without avail, she absolutely refusing to subject herself to this test. In view of all the circumstances, the possibility of infection from this source is rather remote. In fact, from all the data obtainable, it does

not appear that the source of infection of the typhoid cases in this locality can be charged to the milk. The different supplies used by the patients are shown in the following table:

Source of Supply.	No. of Cases.
Dairyman H. L.,	4
Dairyman C. B.,	5
Dairymen H. L. and C. B.,	5
Dairyman T.,	3
Own cows,	2
Various supplies,	2
No supply,	1
Total,	22

An interesting side-light on the relation of milk to this outbreak is in reference to the use of this food product in milk-shakes in the village. It appears that the first suspicious case of typhoid fever in Nuremberg occurred in February, 1913, but the local physician was unable to make a positive diagnosis, telling the patient that she had a "touch" of the disease. The patient in this case was Mrs. Lawrence Nicolodi, living on the main street of the town in the vicinity of the locality where, later on in the summer, a considerable portion of the cases resided. Mrs. Nocolodi was the wife of a man who kept a small store and supplied a portion of the milk used by a local dealer, F. D., for making milk-shakes in his confectionery store. From the facts obtained by the census of the cases, it does not appear that this milk supply was used to any large extent in any of the homes affected but definite facts were not obtainable as to how universally these milk-shakes were used by citizens of the village, but it is to be supposed that children probably constituted the best customers at this store for this particular commodity, and children and minors comprised the majority of the typhoid cases.

Because of the suspicion attached to the case of Mrs. Nicolodi, a specimen of blood was secured from her and this, upon analysis at the Department's laboratories, showed that the examination was "positive to the Widal test." This sample was collected in September, 1913, practically six months after her illness, and indicated that possibly the woman was then a "carrier." To just what extent she may have been a factor in either the inception or the spreading of this disease is difficult of definite statement. At the time of our investigation much doubt existed as to the actuality of this case, but this of course was cleared up later by the positive Widal test.

Water Supply. The third significant feature of the outbreak is in relation to the water supply. The various public and semi-public supplies have been discussed. The use of wells is quite general, nearly every property having one on the premises. Where the various public supplies come into the houses, this is often supplemented by water secured from wells or springs, so that the use of well water is quite general. These are mostly of the dug variety, from thirty to forty feet deep. They are walled up with a loose dry wall, generally carried a short distance above the ground level. In many instances where the wells were examined they were inadequately protected at the surface of the ground against surface drainage, and often the pump platform was leaky, allowing contamination from the outside to enter the well. Almost every residence in the village has a garden attached, often worked close up to the well. From these gardens, with the inadequate protection afforded the wells, it is quite probable that drainage finds its way therein. Moreover, the common method of disposal of kitchen and laundry wastes on the surface of the ground, frequently in the vicinity of a well, is not especially conducive to the preservation of the purity of this water supply. In addition to the above, the town is built on the slopes of a mountain with a very good opportunity for surface drainage from the sections farther up the side of the mountain to find its way into the wells at lower elevations. All of these factors must be taken into consideration in interpreting the results of the analysis of water secured from various wells in the village. These almost uniformly show evidence of sewage, contamination. Numerous samples were collected at the time of the Department's investigation and the results of the analysis of water from the private, public, and semi-public supplies are shown in the following table. These include practically all of the well supplies used by the typhoid fever patients.

RESULTS OF ANALYSES OF PRIVATE, SEMI-PUBLIC, AND PUBLIC WATER SUPPLIES.

Nuremberg Village.

Taken at Residence of	Received at Department Laboratories.							
	June 16.		August 8.		August 25.		September 2.	
	Bact.	B. Coli.	Bact.	B. Coli.	Bact.	B. Coli.	Bact.	B. Coli.
WELLS (Private supply.)								
Elisha Schlach,	40	1	50	2	900	28	80	6
Richard Brobst,	.....	.....	30	1	175	0	10	0
Stephen Singley,	.....	.....	15	0	600	0	3	0
Chas. Kenner,	6	0	.....	.....	5,000	1,025	80	4
Wilson Stouffer,	30	0	500	12	1,500	0	60	0
Robt. Stouffer,	.....	.....	200	10	150	0	20	0
Jacob Sherman,	.....	.....	.....	.....	250	1	10	0
Martin Siewell (Along street—much used),	.....	.....	.....	.....	13,500	18	10	1
Irwin Rape (In front yard—much used),	.....	.....	.....	.....	16,500	2	8	0
Edw. Longenberger,	.....	.....	.....	.....	3,500	0	20	1
Austin Lutz (Spring),	.....	.....	.....	.....	400	0	100	0
SPRINGS (Semi-public supply.)								
Moses Sherman,	.....	.....	.....	.....	1,250	20	25	0
Gernhardt,	.....	.....	.....	.....	2,500	12	1,200	150
PUBLIC SUPPLY.								
Henry Lutz (Springs),	.....	.....	.....	.....	80	0	15	2
Breisch System, tap on pump,	.....	.....	.....	.....	5,400	12	120	0
Breisch System, tap at residence,	.....	.....	.....	.....	5,400	0	2	0

The high counts of samples received August 25th may be partially accounted for by the fact that the samples remained in the express office for twenty-four hours, the ice melted, and the temperature of the water was 75° F.

Precautionary Measures.

The milk dealers were cautioned about the handling of milk and ordered not to take utensils from homes where the typhoid cases existed. In the case of the dairy where it was thought the carrier might exist, the suspect was ordered to refrain from taking any part in the production of the milk and later this milk supply was excluded from the market until the source of infection from this source could be more thoroughly looked into.

Samples of water were collected from the various private and public supplies, as well as springs about the town. In the case of contamination appearing in the private supplies the owner was notified of that fact and advised to give the well a thorough cleaning and adequately to protect his water supply from surface drainage by making the wall and the platform over the well tight. Where springs were found to be suspicious they were placarded and the public warned against the use of water from such sources. And generally the residents of the village were notified of the necessity of boiling water used for domestic purposes for at least thirty minutes prior to its use. This was accomplished by means of notices, through the telephone operator, and by announcements made in the churches. Contamination was discovered in the water from the Breisch system. The owner of this system was instructed to clean out the storage tank and to flush the public system, which was done forthwith.

In addition to the above, the households generally were advised to take the proper precautions to prevent the spread of the disease.

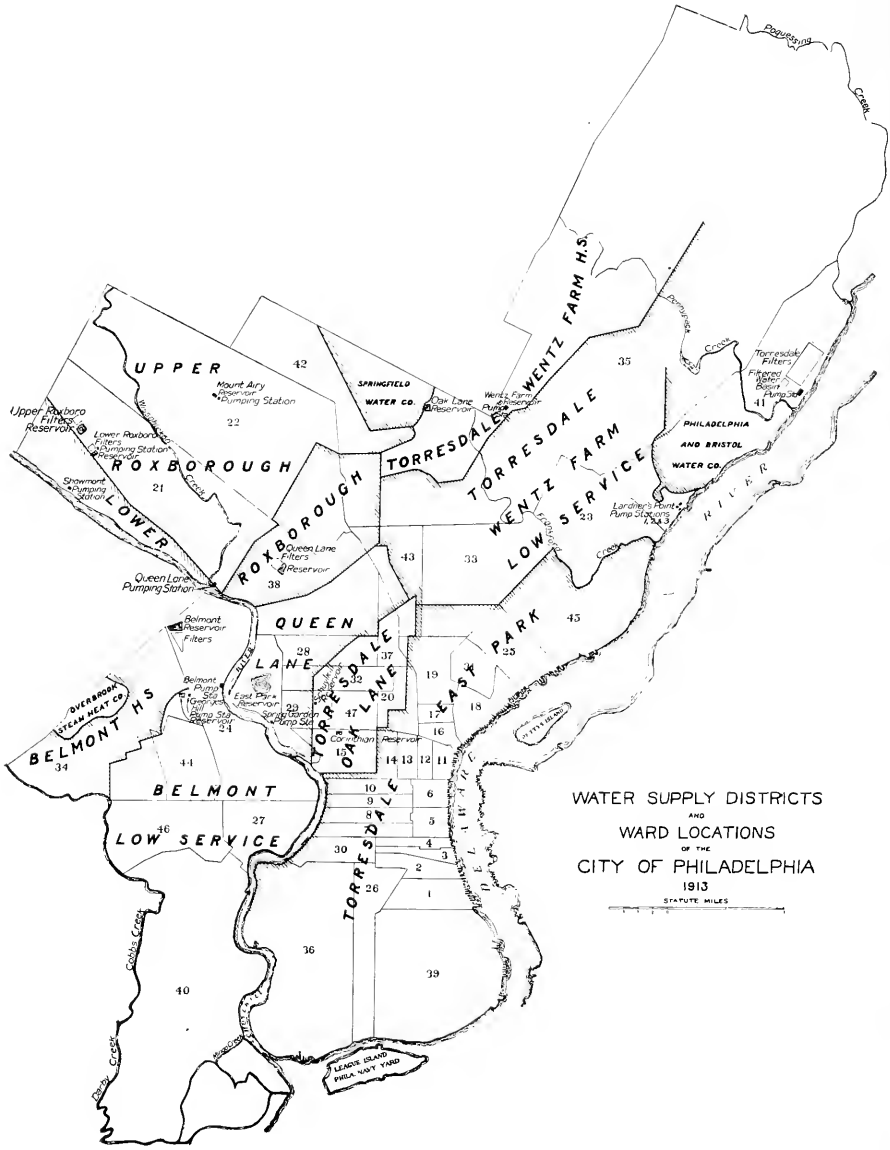
As a part of the investigation, the village was inspected and where nuisances or pollutions were found notices of abatement were issued. This inspection was extended to the village of Weston, about a mile and a half east of Nuremberg, this community being located on the watershed of Tomhicken Creek above the ice pond from which part of the Nuremberg ice supply is obtained. The residents were given advice in general relative to the necessity of maintaining the village in a sanitary condition. There was a movement on foot to sink more wells and to install a public water works system, or rather to extend the one now furnishing part of the town, to the end that the private wells might be abandoned, as it was believed that under the existing method of sewage disposal into privies there was an ever present possibility of contamination of these various wells. At the end of the year this project had not materialized.

An interesting feature of this outbreak is the history of the case of Mrs. Lawrence Nicolodi—ill in February with slight symptoms of typhoid fever, apparently not sufficient to enable the attending physician to diagnose the case, and showing as late as September in the same year a positive reaction when a sample of her blood was subjected to the Widal test. From this household a milk supply found its way into a public store and was here dispensed in small quantities to the public. Later, one of the children in the same household came down with the disease. This, in all probability, was a secondary case from the mother. The effect of the primary case on this community is difficult to estimate.

24. REPORT OF INVESTIGATIONS CONCERNING THE PREVALENCE OF TYPHOID FEVER IN PHILADELPHIA DURING THE YEAR 1913.

Late in the spring the attention of the Commissioner of Health was drawn to the marked increase of cases of typhoid fever in the city of Philadelphia and the Chief Engineer was directed to make a personal inspection of the situation. The hospitals in the city were visited and the records of the Bureau of Health were carefully examined. It was found that there had really been many more cases during the months of April, May, and June than in the same months of 1912 although from January to March the number of cases was less. It also appeared that the wards along the Delaware River were the wards most affected despite the fact that this region is of late supplied with filtered water. Suspicion had been already directed to the existence of a dual system of water pipes in many manufacturing plants. Such a system may easily permit raw river water to be mixed with the filtered water in the mains and thus pollute the drinking water over a large territory. The Department of Health cooperating with the health authorities of the city issued a warning that the situation was serious and that yet more trouble might be expected. The Commissioner of Health concurred in the conclusion that sewage pollution through service connections to manufacturing establishments was the cause of the infection, or at least played an important part in the outbreak.

The Chief Engineer was instructed to watch the progress of the outbreak, and he was again in Philadelphia at the end of July and made a further inspection in the early part of September. Up to this time the epidemic had not abated. Toward the end of the month the situation had become so much worse that orders issued to assemble a field force and undertake a thorough examination of the water


Pennypack Creek
UPPER ROXBOROUGH
LOWER ROXBOROUGH
TORRESDALE
WENTZ FARM H.S.
WENTZ FARM LOW SERVICE
QUEEN LANE
EAST PARK
OAK LANE
BELMONT H.S.
BELMONT LOW SERVICE
Mount Airy Reservoir & Pumping Station
SPRINGFIELD WATER CO.
Oak Lane Reservoir
Wentz Farm Reservoir & Pumps
Upper Roxboro Filters & Reservoir
Lower Roxboro Filters & Pumping Station & Reservoir
Stenton Pumping Station
Queen Lane Filters & Reservoir
Queen Lane Pumping Station
Belmont Reservoir & Filters
Belmont Pumping Station
East Park Reservoir
Torresdale Pumping Station & Reservoir
Carnahan Reservoir
Landreth Point Pumping Station
Torresdale Filters & Filtered Water Basin & Pumps
PHILADELPHIA AND BRISTOL WATER CO.
OVERBROOK STEAM HEAT CO.
LEAGUE ISLAND PHILA NAVY YARD
Cobbs Creek
Darby Creek
Schuylkill River
Delaware River
WATER SUPPLY DISTRICTS AND WARD LOCATIONS OF THE CITY OF PHILADELPHIA 1913
STATUTE MILES

supply of Philadelphia. The operations of this force covered a period of seven weeks of field work and in a limited way of several weeks more; a much longer time was required for the necessary office work. As the investigation proceeded frequent reports were prepared and presented to the Commissioner. These were later combined and elaborated to form a voluminous general report which has been much condensed for this annual report.

In the field the Chief Engineer was assisted by these Assistant Engineers: Paul Hooker, H. E. Moses, R. E. Irwin, S. R. Parke, Jr., C. L. Siebert, R. B. Styer, and M. E. Shaughnessy; and these Inspectors: W. W. Ritter, I. F. Ziegler, C. T. Maclay, J. B. Aurand, D. Zellers, J. M. Hellings, C. P. Jarrett, W. K. Claypoole, J. W. Roebuck, S. B. Engle, E. H. Evans, and W. S. Hood. These officers were utilized in the investigation as circumstances required.

The special inspection of the water works, including the filtration plants, was made by the Chief Engineer with the aid of Mr. Irwin who also mainly conducted the investigations carried on by the State relative to water sampling. The numerous data thus collected appear in his various reports and are extensively reproduced in the account which follows.

The compilation of data relative to the individual cases of typhoid fever was conducted by Mr. Moses, who also directed the field work with reference to truck farms, certain special water supplies, wharves, docks, and ferries, and other questions of a miscellaneous nature. He supervised the preparation of the various report of assistants in the field, and finally compiled the formal general report which is the basis of this publication.

The detailed study of the water supply on wharves, docks, and ferries, and also on the vessels making the port of Philadelphia was made by Messrs. Parke and Siebert with the aid of several Inspectors. Mr. Parke also looked into the bottled water supply of the city and supervised such inspections as were undertaken.

The study of typhoid fever in Pennsylvania within a limited distance of Philadelphia was carried on by the Associate Chief Medical Inspector, Dr. C. J. Hunt, with the assistance of Mr. Shaughnessy and four Inspectors of the Division of Sanitary Engineering. A similar inspection relative to the occurrence of typhoid fever in New Jersey was made by Mr. Hooker who also studied the milk supply of Philadelphia and reported on its possible relation to the epidemic.

The City of Philadelphia obtains its water supply from two sources—the Delaware River and the Schuylkill River—and is divided accordingly into two main water districts. Thus the Delaware River supply is distributed in the Torresdale District, further divided into various sectional sub-districts, and the Schuylkill River supply through four main districts. These various main districts have been named according to the filtration works supplying them, the sub-districts being characterized by some distinction as to the method of service.

The water works system is owned by the municipality and aside from several small districts in outlying sections, furnished through private water companies, practically the entire city is supplied with water through this public system.

On the map accompanying this report are shown the various water distribution districts, reservoirs, pumping stations and filter plants of the city system as well as the sections of the city served by private water companies. The ward locations are also indicated in addition to the principal streams. The nomenclature appearing on the map is used in the descriptive matter of this report. "Torresdale East Park" district is also referred to as "Torresdale Main" district.

The Delaware River water is taken at Torresdale, subjected to filtration and then conveyed through a tunnel of inverted siphon type to Lardner's Point, a distance of about three miles, where the old pumping station and raw water intake are located and where the new twin pumping stations have been erected. The old intake is kept in readiness for use in case of emergency. The uptake from the tunnel delivers the filtered water to the pump chambers, whence it is pumped into the Torresdale water district, comprising a high and low service. In 1913, when the typhoid fever outbreak occurred, there was an estimated resident population in the Torresdale high service district of 204,000 and in the Torresdale low service district a resident population of 894,000, or a grand total of 1,098,000 persons being supplied with filtered water by the Lardner's Point Station. This comprises 67.3 per cent. of the entire city population, which in 1913, was estimated to be 1,632,000.

The Schuylkill River water is taken at three places, namely, at Shawmont, Queen Lane, and Belmont.

The Shawmont pumping station is near the city boundary. It pumps the water into a large reservoir used in connection with the Upper Roxborough filter plant and it also delivers the river water into a small sedimentation reservoir operated in connection with the Lower Roxborough filter plant. These two filter stations

and reservoirs are near each other and partly interchangeable. The combined district served by these filter plants contains a resident population estimated at 146,000.

The Queen Lane pumping station is in East Fairmount Park, just below the mouth of the Wissahickon Creek. It raises water to a reservoir used in connection with the Queen Lane filtration plant. Thence it is supplied to a district having an estimated resident population of 102,000.

The Belmont pumping station is in West Fairmount Park, about five miles below the Shawmont pumping station. It raises the river water to a storage and sedimentation reservoir used in connection with the Belmont filter plant. Thence the water is supplied to all of the city territory lying west of the Schuylkill River. Here in 1913 there was a resident population estimated at 261,000.

The total population in the city supplied with filtered Schuylkill River water is therefore 509,000 or 31.2 per cent. of the entire city population. There is a section of the city in the northeast that is not supplied with City water. Here reside approximately 30,000 persons, equal to 1.5 per cent. of the entire city population.

Two hundred million gallons of filtered water are supplied daily to the Delaware River water district. In the Schuylkill River water district 107,000,000 gallons of filtered water are supplied daily divided as follows:

Upper Roxborough District, Lower Roxborough District,	21 million gallons
Queen Lane District,	50 million gallons
Belmont District,	36 million gallons
Total in Schuylkill River Water District,	107 million gallons

TORRESDALE FILTRATION WORKS.

The Torresdale Station consists of an intake, a low lift pumping station, preliminary filters, sixty-five slow sand filters and a filtered water basin, and is designed for a daily capacity of 240,000,000 gallons. All of the filters are covered and protected from the weather. So also is the clear water basin. The latter has a capacity of 50,000,000 gallons at the normal water line. The water is therefore displaced four times every twenty-four hours at the present rate of consumption in the district supplied by Torresdale water. During July, 1907, twenty-five slow sand filter units were put in service. They supplied 40,000,000 gallons to the consumers. In November other units had been added and 60,000,000 gallons of filtered water were delivered daily to the consumers. On March 1st, 1908, all of the filter units were in commission and the output was increased to 80,000,000 gallons daily, and in May of 1908 the maximum yield without pre-filters of 110,000,000 gallons daily was reached.

Intake and Pumping Station.

The station house in which the pumps are located that supply the raw Delaware River water to the filtration works, is located on the west bank of the river in the Forty-first ward near the northern city limits.

Beneath the pumps is the suction chamber or well extending the entire length of the building. Terminating in this well is a re-inforced concrete intake, horse-shoe shaped, 14 feet wide, 10 feet 6 inches high and 700 feet long, projecting out into the river seventy feet beyond the Port Warden line. At the outer end is a gate house reached by a suspension foot bridge and mid-length is a second gate-house, planned originally as an inlet from a sedimentation basin that was to have been constructed along the river's edge north and south from the intake. The funds were not forthcoming; but this second gate-house proved serviceable nevertheless. It has been used as an intake—through a dredged channel—especially in winter when needle-ice has put the screens of the other gate-house out of business.

Both gate chambers have shut-off sluice gates, operated electrically, and removable screens. In the fall and spring months following heavy rains, the river water contains leaves in abundance which clog the screens requiring more attention; but the trouble is not insuperable. In the ice gorge season, field ice may back up in front of the ports and lower the head of water four or five feet in the gate-chamber, necessitating constant watchfulness and additional help. But the only difficulty experienced at the outer house that has been insuperable—which puts it out of commission—is that from needle-ice. These needles will clog up a screen sometimes in a few minutes. Then it is that the second gate-house is used. The water is warmer there, possible due to the discharge of condensation water nearby into the dedged channel.

In the station there seven centrifugal steam driven pumps, each of forty million gallons capacity, and one fifty million gallon pump, totalling 330 million gallons for twenty-four hours were all the pumps in service at one time. They lift the

raw river water through an eleven foot steel conduit, encased in concrete, to the pre-filters, elevated thirty-seven and a half feet above mean high tide. The water can be delivered direct to the final sand filters, a by-pass being provided for this purpose; but it is not used.

There are also in the station two five million gallon centrifugal steam driven turbine pumps for supplying pre-filtered water, taken from the effluent pipe of the pre-filters to the preliminary filters for washing purposes, and two smaller pumps, one an old two million gallon Worthington compound duplex pump and the other a two and a half million gallon centrifugal pump. These supply raw water to the final sand filters for sand washing purposes.

From the entrance of the water to the preliminary filter plant the water flows by gravity through the entire treatment works to the filtered water basin and thence on through the inverted siphon or tunnel to the city service pumps, three miles distant, at Lardner's Point Station.

Preliminary Filters.

The preliminary filters were started in operation in February of 1909 and have since been in continuous service. They remove over sixty per cent. of the sediment in the raw water and have doubled the output of the sand filters.

The turbidity of the raw water is highest in February and March. Then both the pre-filters and final filters are much impeded in handling the raw water. In February and March of 1912 that freshets brought down large quantities of sediment and it was with difficulty that the filters were kept open sufficiently to pass the water through. Hypochlorite of lime was then applied to reduce the bacteria in the filtered water.

The pre-filters are of concrete construction arranged in eight rows of fifteen units each, covered with a flat concrete roof supporting sixteen inches of gravel, loam and sod. There are four filter houses each containing thirty units. In each filter house there is a central pipe gallery, on either side of which are fifteen filters, the two rows facing each other, making the total of a hundred and twenty filters.

Each filter is approximately twenty feet wide by sixty feet long and is controlled independently by its own operating table. The raw water is admitted through a gullet extending the entire length of the rear of the bed, and is controlled by a sixteen inch hydraulic valve operated from the table in the filter gallery.

The eleven foot raw water supply conduit is laid in the ground along the front of the plant and from it lead three seven foot feed pipes, one for each double row of filters, and two five and a half foot pipes, one for each of the two single rows of filters discharging into the influent gullet.

On the floor of each bed there are two longitudinal re-inforced concrete collectors, extending the entire length of each bed and each thirty inches wide and eight inches high in the clear placed on either side of the wash water gullet or drain that is built up from the floor four feet three inches high and dividing the bed into separate longitudinal compartments to this height. Water enters the collectors through openings in the sides.

The filtering material is thirty-four inches in thickness. First comes a fifteen inch layer of stone, two to three inches in size, laid on the filter floor the entire width and covering the concrete collectors. Above this is a four inch layer of stone, five-eighths to an inch and a half in size. Then comes a three inch layer of gravel, one-fourth to half an inch in size. On top of this is the final layer of sand twelve inches in thickness.

The depth of water maintained over the filtering surface is four feet. The water passes downward and thence out through the two concrete collectors into a sixteen inch effluent pipe, provided with a hydraulically operated valve and rate controller, one for each filter, located in the pipe gallery. The water then passes to the reinforced concrete effluent gullet six feet square, located in the central gallery under the operating floor in each filter house. The four effluent gullets from the entire filter group discharge into an eleven foot steel riveted conduit that conveys the pre-filtered water to the slow sand filter.

The washing process consists in reversing the flow in the filters. To regulate the pressure of the wash water there is a re-inforced concrete wash-water tank located outside, containing two seperate concentric compartments, one for wash water and one for filtered water, used for drinking and sanitary purposes. The tank floors are twenty-seven feet above the surrounding filters.

Only pre-filtered water from this tower is supplied for washing the pre-filters. The two five million gallon wash water pumps are ample in capacity and if both were to be out of service temporarily raw water could be supplied by a big pump.

On top of the effluent gullet in each filter house, beneath the operating floor, is a thirty inch wash water supply main and from it the wash water is led into each filter unit through a twenty inch spiral riveted pipe suspended from the roof and connected at the centre of the bed with four twelve inch pipes diverging towards the corners, which in turn connect each with two vertical eight inch downtakes that deliver the water to the manifold piping system in the gravel underdrains.

The air wash system comprises a main air supply pipe, twenty inches in diameter, running the full length of each filter house and suspended from the roof. A blower operated by an electric motor is located in each house and the systems in the four

houses are connected by pipes laid in the front gallery extending along the entire plant. The air system is connected to the wash water piping and the air is introduced through the manifold of each filter.

Above the concrete collectors, but not connected to them, is the manifold system for air and water washing, consisting of an eight inch main with branch one and a half inch galvanized pipes on either side laid in parallel rows, five and three-fourth inches on centres, with three-sixteenth inch holes underneath, spaced five and three four inches on centres, all placed in the middle gravel layer of each compartment.

The washing process is as follows:—Each filter is supplied with ten wash water troughs, five on each side of the main wash water gullet or drain in the centre of the bed to which the ten troughs extending from the side walls connect. These troughs are of galvanized sheet steel, semi-circular in section, eighteen inches wide, and are six inches deep at the side wall and nine inches deep at the centre gullet. The weir or lip of the troughs was designed to be fifteen inches above the sand surface. In washing, the water on the sand is first drawn down to the level of the wash water troughs, it is then shut off and the air is turned on for three minutes, followed for one minute by an upward flow of wash water. Again for two minutes air is supplied and after that for a minute and a half wash water is again furnished. The dirty water, mud, and sediment washed from the filter sand flows away in the troughs and gullet through a hydraulically operated twelve inch by thirty-six inch sluice gate into an open drain in lower portion of the pipe gallery of the filter house on either side of the effluent gullet, finally passing into a three foot circular brick drain at the rear end of the filter house, connecting to an eight and a half foot main drain that empties into Pennypack Creek.

There is no filtering to waste at this plant. On Monday December 1st, 1913, the day of the State Health Department's inspection of the works, a sample of pre-filtered water, collected immediately after the resumption of service of a unit succeeding washing, showed high color. Also the sample of raw water on the filter showed high color; both samples being distinctly inferior in appearance to the water in the Delaware River. This showed that the stirring up influence due to washing materially affected the water under and over the filter just after washing. Were the preliminary filters to be brought to a high stage of efficiency the wasting of the filtered water of the first minute or two after washing would be desirable. There is a six inch hand drainage gate at the bottom of each bed that could be fitted to operate quickly, preferably by hydraulic pressure.

When the pre-filters were started in February 1909, there was, as explained, a space of fifteen inches between the sand surface and the top of the trough. Now there is an average space at all of the 120 units of 20.6 inches, ranging from eight to twenty-six inches. This loss of three to eleven inches of filtering material with a consequent loss in efficiency is attributed to the working down of sand into the spaces in the gravel layers below, and to the passing away of some of it with the wash water. Each unit should be filled to its normal level with coarse sand as near 0.8 mm. in size as possible.

Final Filter—Slow Sand.

There are sixty-five slow sand filters ranging in eight groups or batteries, four on the west side and four on the east side of a central driveway paralleling the Delaware River. At right angles to this driveway there are three courts running east and west and each faces on one of these courts. The battery arrangement is indicated in the following table:

ARRANGEMENT OF SLOW SAND FILTERS AT THE TORRESDALE WORKS.

Battery—Number.	Number of Filters.
1—Single group.	1 to 5 inclusive.
2—Single group.	6 to 11 inclusive.
3—Double group.	18 to 27 inclusive.
4—Double group.	12 to 17 inclusive. 28 to 33 inclusive.
5—Double group.	40 to 49 inclusive.
6—Double group.	34 to 39 inclusive. 50 to 55 inclusive.
7—Single group.	62 to 65 inclusive.
8—Single group.	56 to 61 inclusive.

The filters are rectangular in shape, forty-three measuring 140 feet by 235 feet in plan, and twenty-two measuring 132 feet by 253 feet in plan, giving an area for each of approximately three quarters of an acre. They are all constructed on the same level, are built of concrete, covered by groined arches and have puddle under the floor and surrounding the side walls. The floors are inverted groined arches six

inches thick at the centre and fourteen inches under piers. The puddle is carried up around the outside walls to a point one foot above the water line of the filters The vaulting is semi-elliptical, groined arches fourteen feet span, three inches rise and six inches thick at the crown, and twenty-one inches thick over the piers. The piers are thirty-four inches square at the base and twenty-two inches square at the sand line. Ventilator shafts are provided in the roof for light and air. On top of the vaulting is placed a four inch layer of broken stone supporting sand, loam and well trimmed sod.

The filter underdrainage or collecting system is built as follows: The main collector is built of concrete and extends longitudinally in the centre for the entire length of each sand filter. It is four feet wide and sixteen inches deep, without openings. Eight inch vitrified pipe lateral collectors enter this drain on either side. The laterals are placed in each bay, some being perforated and others having open joints. The lines are plugged at the end remote from the main collector. Over the collectors, resting on the floor, is placed coarse gravel, one and three-quarters inches to three inches in size, then a four inch layer of gravel, one and three quarters to five eighths inch size, and then on top a three inch layer of fine gravel, one-quarter to five-eighths inch in size, supporting a two inch layer of very fine gravel and above this is one inch layer of coarse sand, totalling sixteen inches of underdrainage. Above is placed filter sand, thirty inches deep, effective size of 0.28 to 0.36 mm. with uniformity co-efficient of about 2.5.

Each filter is provided with a regulating house containing all valves pertaining to the operation of the filter, also automatic effluent regulators which maintain a uniform rate of filtration regardless of the constantly fluctuating friction through the sand. Each filter has its own valve chamber in which is located the floating weir for controlling the rate of filtration. Each filter is also provided with a large entrance at the court level to afford facilities for maintaining the filters.

The applied water is conveyed to the final filters in an eleven foot conduit that extends along Delaware Avenue and branches into each court. The piping for each filter unit is located in the court in front and consists of supply, effluent, drain, refill, valved chamber drain, overflow, and pressure lines, the latter for sand washers. There is no way provided to by-pass the final sand filters. All water delivered to the city must pass through the final sand filter beds. The applied water is discharged from the supply main in the court to the regulating house in the corner of the filter bed and thence it passes over a weir to the filter. The heavy sediment subsides in this corner and is deposited on the sand filters. The finer sediment requires more time to subside and hence more of it is deposited on the sand surface near the opposite and remote corner of the filter bed. In this portion of the filter also the penetration of sediment into the sand is deeper.

When the filter bed becomes clogged one of three methods of cleaning may be employed as explained in the following paragraphs:

The method of cleaning originally planned is still occasionally employed as follows: The filter is first put out of service, allowing the water above the sand level slowly to filter through until the level subsides to a depth of one foot below the surface level of the sand. This takes about thirty hours on the average. Laborers then enter and scrape off the upper dirty layer of sand contining mud and other suspended matter. The depth of scraping depends upon the depth of layer of discolored sand, from one inch to several inches. The dirty sand is placed in piles and then shoveled into a portable ejector that by water carriage conveys the material to the permanent washer erected in the court outside.

These permanent sand washers are of the ejector type, and consist of a series of hoppers, thirty-six inches in diameter, into which dirty sand from the filters is discharged. The sand finds its way to the bottom of the hopper and is ejected to the next hopper and so on. The dirty water overflows to the sewer. The water used for this washing purpose is under high pressure. It is taken raw from the river and is pumped in a single line used for no other purpose connected up to the high pressure pipes in each filter bed and at the washers. The dirty sand contains all the objectionable matter strained out of the filtered water. The object of washing is not to sterilize the sand but to cleanse it sufficiently to permit the filter to be used again as a strainer. Hence, since the dirty sand may contain more bacteria than the raw river water used for washing, a series of experiments were conducted to find out whether filtered water or raw river water washing would make any difference and it was concluded that it would not. The pressure pipe lines are not big enough to facilitate rapidity in removing the sand from the bed by this method.

The sand, cleaned by this method is piled in the court, and once a year it is replaced in the filters. These periods of re-sanding put out of commission a filter for a considerable portion of time. Furthermore, in the spring of 1912, (the worst period of bad water ever experienced) the sand filters were suddenly clogged and extreme efforts have been put forth to keep the plant in operation. In fact the filters have never yet been put back into as good a condition as they were before. So much sand had to be removed and washed and piled up on the courts that there has not been opportunity since to replace all of it. There are now six filters with a depth of twenty-two inches only of sand and the others have from twenty-six to thirty inches of sand in them, thirty inches being the normal depth.

After a bed has been cleaned, a valve is opened in the regulating house and filtered water backflows the underdrain and the sand to a level of four inches above the sand surface. Then pre-filtered water is applied as usual and filtration is resumed

but at a rate of a million gallons an acre daily for the first twenty-four hours, increasing the rate each succeeding twenty-four hours one million gallons until the six million rate is reached, which gives an average output of four and a half million gallons yield to the filter bed in twenty-four hours. When, however, the river water is bad, this period is shortened in order to deliver as much filtered water as the city demands and this, of course, tends to lower the degree of purification attained. In order to obviate this, either the water must be more perfectly pretreated or more sand filter units must be added.

The "Brooklyn method" of sand cleaning is also used. This method permits the sand to be cleaned in the filters without removal to the court. The water is drained off to a depth of a few inches above the sand surface and outlets, which permit the water remaining above the surface of the sand to flow off, are then opened. The wash water is applied at one end of the bed and is allowed to flow over the sand surface at the rate of half a foot a second velocity. The direction of flow is guided by boards set on edge, forming channels of the width of a bay, approximately fifteen feet. As the water flows over the sand, the layer is raked by men standing on the surface of the bed. This raking is continued until the water flowing off is clear. Water is then applied as usual and filtration resumed. No wasting of the first filtered water is ever accomplished. This method suffices to keep the filter in service a little longer, but does not stop the gradual accumulation of the mud deeper in the sand spaces. It postpones the time when the bed must be drained and the sand cleaned to a considerable depth.

The third way of cleaning is known as the Nichols method. The apparatus consists of the ordinary ejector which delivers the sand and water into a device called a "separator," mounted on wheels and moved into the filter for the time being. The separator is a steel cylinder forty-two inches in diameter and three feet high, having a cone shaped bottom in which is placed a valve and hose connection through which the sand is forced from the separator. The interior is arranged with baffles and a disc so that there is a down-flowing stream of sand and an up-flowing stream of wash water which is wasted to the sewer. The clean sand is discharged through a two inch line in small piles direct to the filter surface and is then spread and leveled by hand or it may be deposited in place by manipulation of the hose.

At the present time by this method the turning over of the sand from twelve inches to fifteen inches in depth is going on. Thirty filters have been deep cleaned and a force of men numbering 110 (which is twenty-five more than the ordinary force) is at work on the remainder. Four beds can be completed in a week working ten hours each day.

The dirty wash water is carried off by sewers to the Pennypack Creek outfall. The effluent is discharged into pipes laid under the courts which connect with a reinforced concrete conduit, horse-shoe shaped, equivalent to ten foot circular, leading to the filtered water basin.

In the court are constructed shelter houses for the convenience of the employees.

Filtered Water Basin.

The filtered water basin is constructed on lower ground, is groined arched, covered and maintained as a lawn, the top being water tight and the surface water drained to the sewer. It is rectangular in shape, 762 feet long by 602 feet wide, with an available depth of fifteen feet, giving a capacity of fifty million gallons at the normal water line. The filtered water passes into the basin at one of its corners through an inlet gate house located on the State Road opposite the laboratory building. This gate house is provided with eight sluice gates near the bottom and is arranged so that the filtered water basin can be shut off and the water passed around it through a reinforced concrete conduit eight feet in diameter. A seventy-two inch valve is placed on the by-pass and can be operated electrically from the interior of the inlet gate house.

In the corner diagonally opposite to the inlet an outlet chamber is constructed where provision is made for placing wooden stopplanks which may be used to prevent water entering from the by-pass in the event of emptying the filtered water basin. An overflow chamber is constructed in the conduit leading to the entrance shaft of the Torresdale conduit so that when the water level reaches an elevation of 7.25 City Datum it will overflow into the sewer.

In the inlet gate chamber in front of the sluice ports chlorinated lime solutions are applied. Each port is forty-eight inches in diameter and all eight of them are open.

Torresdale Conduit.

The Torresdale Conduit carries the filtered water from Torresdale to the Lardner's Point pumping station, three miles distant down stream on the Delaware River, where it is pumped into the distributing system. The conduit is 13,809 feet in length, between end shafts, and is constructed entirely in tunnel, ten feet seven inches internal diameter. The elevation at the entrance shaft is 127 feet below the ground surface and the lower end is ten feet higher, this rise of ten feet in about 14,000 being provided to prevent air locks. The shaft at the inlet end is connected with the conduit leading from the Torresdale filtered water basin and is of the same diameter as the conduit. Provision has been made in the construction of this shaft

for a future connection to the Torresdale filters in case of their extension. The upper portion of the shafts is constructed of steel shells which extend through the soil down to and partly into the rock and are lined with brick. The elbows at the bottom of the shafts are built of concrete on radii of fifteen feet and nine inches. The tunnel is lined with hard-burned brick backed with concrete. The lining in the invert is of two courses of brick laid on a cradle of concrete. The arch ring varies from three to five courses of brick, depending upon the nature of the material in the roof of the tunnel. The shaft at the Lardner's Point end has a diameter of twenty-one feet for the upper forty feet and decreases funnel shape into the lower portion of the shaft, which is ten feet seven inches in diameter. Two connections are made with the shaft, one fourteen feet and the other seven feet in diameter, leading to the pump well.

Lardner's Point Pumping Station.

The pumping plant at Lardner's Point consists of three separate pumping stations. The first is an old station, now known as No. 1 house and formerly termed the "Frankford Pumping Station," and was used in the old system to pump water from the Delaware River to the Frankford Distributing System. The former intake to the Delaware River is still maintained for emergency used but is kept tightly closed. A new connection has been made to the filtered water conduit leading from the outlet shaft of the Torresdale Conduit.

The pumping equipment in this station comprises one compound, vertical Cramp pump of ten million gallons capacity, one Wetherill horizontal of ten million gallons capacity, one Southwark vertical of twenty million gallons capacity and a Southwark vertical-horizontal of fifteen million gallons capacity. This station has twelve Marine type boilers of 200 H. P. capacity each.

Two entirely new stations were constructed and contain twelve vertical, triple expansion Holly pumping engines each of twenty million gallons daily capacity. The boiler rooms are built separate from the engine room, No. 2 having boilers aggregating 5,400 H. P. and No. 3 aggregating 4,000 H. P. The water ends of the pumps are set in the basement under the floor of the engine room, the entire steam ends all being above the floor level. The pump well is under the basement floor in the centre of the engine houses, extending their full length. It is constructed of reinforced concrete, horseshoe-shaped in section, fourteen feet in width and height.

Between Engine Houses Nos. 2 and 3 a gate chamber is located which controls the discharge from the larger connection to the outlet shaft of the Torresdale Conduit. It is connected to the pump well of both houses, and gates have been installed for connecting the pump well of a future house to be located west of the present plant.

Filtered Water at the Torresdale Works.

A comprehensive study of the filtered water as supplied from the Torresdale plant was undertaken by officers of the State Department of Health as a part of the investigation made relative to the typhoid fever outbreak. This comprised a study of the water at the filtration plant itself and also in the distribution district. There are two testing laboratories maintained by the City Bureau of Water, one at Torresdate in charge of Francis D. West and here all of the analytical work connected with the sampling of the Torresdale water is performed; the other at the Belmont filter plant, in charge of Dr. George E. Thomas, and here the testing of the samples of the Schuylkill River water supply is carried out.

At Torresdale the filtered water basin samples are collected near the outlet of the basin, two samples being taken every forenoon for bacteriological analysis. The plating of the bacterial samples is done with gelatin, the development being at 20° C. for forty-eight hour periods. The B. Coli samples are placed in dextrose broth, using the Smith tube. If a gas is evolved after forty-eight hours at 37° C. some of the broth is plated on litmus lactose agar for pink colonies. From this plate a pink colony is picked and placed in dextrose broth for B. Coli determination. If gas is evolved in the tubes seeded with pink colonies and fifty per cent. of it is absorbed by sodium hydrate solution, this is taken to indicate sufficient carbon dioxide to show the presence of B. Coli. Hence the process is not a count, but is carried a little farther than the usual presumptive test.

What two little samples of water reveal, if negative, is a slender basis upon which to rest an opinion as to the quality of the very large volume of water from which the samples are taken, unless the attending circumstances are convincing. The bacterial results are obtained from the examination of less than one pint of water out of 200,000,000 gallons. The filtered water basin holds 50,000,000 gallons and this volume has to be replaced four times every twenty-four hours. Hence two samples daily indicate little when considered alone.

A composite sample, made up of hourly collections throughout the twenty-four hours, should be prepared daily for testing the water in the filtered water basin.

Chlorinated lime was applied at the entrance to the filtered water basin November 20th, 1910, for the first time, due to falling off in bacterial efficiency of the slow sand filters and the appearance of B. Coli in the filtered water. This treatment was discontinued May 9th, 1911, was resumed December 5th, 1911 and constant applications of the disinfectant have been made ever since.

The following tables show in a summarized form facts indicative of the quality of the water as revealed by the analysis of samples procured at the filtered water basin. In the tables the monthly averages are shown:

Monthly Averages For 1911.

	Total bacteria in the filtered water basin samples.	Percentage of times B. Coli were found in filtered water basin samples.		Remarks.
		In 1 C. C.	In 10 C. C.	
January, ...	25	3	17	Treated with hypochlorite.
February, ...	11	14	14	Treated with hypochlorite.
March, ...	8	3	10	Treated with hypochlorite.
April, ...	10	0	3	Treated with hypochlorite.
May, ...	14	3	40	Not treated with hypochlorite.
June, ...	19	7	47	Not treated with hypochlorite.
July, ...	10	10	48	Not treated with hypochlorite.
August, ...	14	10	57	Not treated with hypochlorite.
September, ...	19	10	67	Not treated with hypochlorite.
October, ...	10	19	70	Not treated with hypochlorite.
November, ...	120	43	100	Not treated with hypochlorite.
December, ...	16	0	30	Treated with hypochlorite.

It will be noted that the sewage organisms increased in the filtered water during the months that the hypochlorite was not applied, but that the diminution was very marked for December during which the disinfectant was used.

Monthly Averages For 1912.

	Total bacteria in the filtered water basin samples.	Percentage of times B. Coli were found in filtered water basin samples per C. C.		Remarks.
		In 1 C. C.	In 10 C. C.	
January, ...	30	3	7	Treated with hypochlorite.
February, ...	250	3	24	Treated with hypochlorite.
March, ...	99	3	19	Treated with hypochlorite.
April, ...	22	0	10	Treated with hypochlorite.
May, ...	17	3	8	Treated with hypochlorite.
June, ...	13	7	34	Treated with hypochlorite.
July, ...	8	7	16	Treated with hypochlorite.
August, ...	7	0	26	Treated with hypochlorite.
September, ...	10	7	30	Treated with hypochlorite.
October, ...	15	3	30	Treated with hypochlorite.
November, ...	17	3	41	Treated with hypochlorite.
December, ...	40	7	16	Treated with hypochlorite.

During 1912, when one half part or more of the disinfectant powder to the million gallons of water was used, out of 364 tests only 2.5 per cent. of the samples collected from the filtered water basin showed the presence of B. Coli in one cubic centimeter of the water.

For the year 1913 better results were secured as will appear in the following table. Out of 212 tests made up to September 1st, only two were positive in one cubic centimeter; and for ten cubic centimeters seven were positive.

Monthly Averages For 1913.

	Total bacteria in the filtered water basin samples.	Percentage of times B. Coli were found in filtered water basin samples per C. C.		Remarks.
		In 1 C. C.	In 10 C. C.	
January, ...	23	3	16	Treated with hypochlorite.
February, ...	6	0	0	Treated with hypochlorite.
March, ...	11	3	3	Treated with hypochlorite.
April, ...	10	0	0	Treated with hypochlorite.
May, ...	5	0	0	Treated with hypochlorite.
June, ...	5	0	0	Treated with hypochlorite.
July, ...	4	0	7	Treated with hypochlorite.
August, ...	6	0	10	Treated with hypochlorite.
September, ...	.....	.....	.....	.....
October, ...	.....	.....	.....	.....
November, ...	.....	.....	.....	.....
December, ...	.....	.....	.....	.....

In a report made by Francis D. West, Chemist in charge of the Torresdale Laboratory, the following statements were made at the Convention of the New England Water Works Association in Philadelphia in September 1913.

"As constructed at present, using hypo-chlorite, the Torresdale filtration plant can and does produce an effluent that is almost entirely free from pathogenic bacteria, that is, perfectly safe to use without boiling or further treating, but one that is not always clear.

"A plant constructed as Torresdale, without any sedimentation basin, is utterly unable to cope for any prolonged period with water having a turbidity of over 100, that is, with the slow sand filters operating at a six million rate. When such a condition is reached, the pre-filters failed to do their proportion of work, and the final filters choke badly, allowing fine silt to pass through them. This chocking necessitates cleaning for twenty-four hours a day with 55-58 filters doing the work of 65 and depending upon hypo-chlorite to reduce the number of bacteria and destroy the pathogens, which it does.

"Fortunately the periods of turbid water occur but seldom and are of short duration.

"The pre-filters should be changed and operated like the coal filters at Steelton, or a sedimentation basin should be constructed, using alum to coagulate the water.

"But, to summarize, including the very worst periods the bacterial efficiency of the Torresdale filter plant averages over 99.5 per cent; the water is clear and sparkling at least forty-eight weeks of the year, and is perfectly safe to drink at all times."

The condition of the Delaware River varying in the quality of its water from time to time has a vital bearing upon the operation of the Torresdale filter plant. The Delaware is a fresh water stream for several miles below Philadelphia; nevertheless, it is affected by tides as far up-stream as Trenton, eighteen miles above Torresdale. The quality of the water at the Torresdale intake is affected by the sewage of Philadelphia. Every flood tide brings sewage up past the Torresdale intake.

From May to November the efficiency of the filter plant is at its highest. The bacterial count of the Delaware River water fluctuates greatly depending on the tide and influenced by the city sewage. The Torresdale intake is about a quarter of a mile above the mouth of Pennypack Creek. The city built a disposal plant here to care for the sewage tributary to this stream, the works being put into operation on December 18th, 1912. A little less than a million gallons daily are treated and the works include Imhoff tanks, sprinkling filters, and sterilizing apparatus. The plant operated until about July 1913, when by an accident it was put out of commission for practically two months, resuming operation about the first of September and being shut down for a week the latter part of September after which time it was again put into commission and operated for the balance of the year. While the plant was shut down an attempt was made to treat the sewage at the sewer outlet with a disinfectant.

A large amount of sewage passes the intake on every flood tide. In the following table is given the bacterial count of the raw river water and the water in the filtered basin for the years 1907 to 1912 inclusive. For 1907 the reports are for the last six months of the year. The preliminary filters were in service early in 1909.

BACTERIAL COUNTS AT TORRESDALE.

Year.	Delaware River.			Filtered Water Basin.		
	Max.	Min.	Ave.	Max.	Min.	Ave.
1907, ...	270,000	600	17,000	5,600	12	499
1908, ...	60,000	550	6,600	2,800	22	196
1909, ...	120,000	400	9,100	2,000	7	103
1910, ...	50,000	490	7,000	400	2	44
1911, ...	61,000	700	7,600	480	2	25
1912, ...	120,000	720	11,100	2,100	1	44

A careful study of the records, before 1913, of river stages, turbidity, rainfall, temperature, and of the bacterial data as related to the Torresdale plant has been made. These records were obtained from the United States Weather Bureau Station at Philadelphia and from the office of the city Water Bureau. The river stage is measured at Trenton beyond the influence of tidal action and represents the yield of a watershed of about 8,600 square miles. The figures are the height of the river above extreme low water. These various data have been tabulated for each month in 1913, from January to October inclusive, and deductions made as to the influence of these various factors on the quality of the water produced at the Torresdale plant. The following table is shown as one that is more or less typical.

TORRESDALE—RIVER DATA—September, 1913.

Day of Month.	Raw River Water.			Rain fall	Temp.	Filtered Water Basin.			
	River Stage.	Turbidity.	Bacteria per C. C.			Bacteria.	Turbidity.	B. Coli.	
								1 C. C.	10 C. C.
1,	0.3	11	9,400	0	76	6	0	—	+
2,	0.2	12	6,200	0	76	2	0	—	+
3,	0.3	13	7,400	0	78	8	0	—	+
4,	0.3	10	8,700	Trace.	80	4	0	—	+
5,	0.2	10	6,300	.01	78	2	0	—	+
6,	0.3	18	10,000	Trace.	68	8	0	—	+
7,	0.3	48	10,000	.68	78	12	0	—	+
8,	0.3	21	13,000	Trace.	78	3	0	—	+
9,	0.6	22	3,000	0	65	3	0	—	+
10,	0.4	16	6,200	0	69	6	0	—	+
11,	0.3	15	2,900	0	64	12	0	—	+
12,	0.3	14	3,600	.23	65	6	0	—	+
13,	0.2	12	2,300	.05	66	6	0	—	+
14,	0.2	15	2,200	0	58	8	0	—	+
15,	0.2	12	1,100	0	56	2	0	—	+
16,	0.2	11	3,200	0	60	3	0	—	+
17,	0.3	12	1,900	.16	67	4	0	—	+
18,	0.2	12	4,200	1.29	70	4	0	—	+
19,	0.3	20	6,000	.01	62	3	0	—	+
20,	0.2	18	3,800	.05	62	3	0	—	+
21,	0.2	14	3,200	1.74	72	—	0	—	+
22,	0.6	27	20,000	.01	62	4	0	—	+
23,	0.4	42	7,600	0	58	8	0	+	+
24,	0.5	31	4,900	0	62	10	0	—	+
25,	0.4	28	4,600	0	56	2	0	—	+
26,	0.3	20	2,800	0	68	4	0	—	+
27,	0.6	15	5,000	0	64	4	0	—	+
28,	0.5	25	6,500	0	62	6	0	—	+
29,	0.4	24	1,400	.01	63	1	0	—	+
30,	0.3	14	1,200	Trace.	68	2	0	—	+
Average,	0.3	19	5,400			3			
Maximum,	0.6	48	20,000			12			
Minimum,	0.2	10	1,100			1			

The turbidities are expressed in parts to the million determined by the silica standard. The maximum, minimum, and average turbidities for the raw river water and the filtered water are given in the table following for the years 1907 to 1912 inclusive, the averages for 1907 being for the last six months of the year. The preliminary filters were started in 1909.

Turbidities.

Year.	Raw Delaware River.			Filtered Water Basin.		
	Max.	Min.	Ave.	Max.	Min.	Ave.
1907,	190	5	32	10	0.05	2.8
1908,	720	10	39	18	0	2.1
1909,	350	7	39	24	0	0.81
1910,	60	6	25	8	0	0.22
1911,	97	5	16	3	0	0.07
1912,	1,050	2	37	51	0	1.11

During the months when the turbidity is least there is considerable difficulty encountered in keeping the sand beds open. Micro-organisms, commonly the diatoms and green algae, cause the beds to go out of service rapidly. In addition the water contains considerable amorphous matter appearing in hard pasty form on the sand surface. During May and June of 1913 when the turbidity of the river was low, considerable difficulty was experienced in keeping the filters open. In spite of this, no B. Coli were found in the samples of the filtered water basin water analyzed in May or June.

The times when turbidity and B. Coli were present during 1913 in samples drawn from the Torresdale filtered water basin appear in the following tabular statement:

Filtered Water Basin.

Date.	Turbidity.	B. Coli.		Date.	Turbidity.	B. Coli.	
		1 C. C.	10 C. C.			1 C. C.	10 C. C.
January 1	+			July 1			+
2	+	+	+	9			+
3	+			August 21			+
4	+			22			+
5	+			23			+
6	+		+	September 1			+
9			+	4			+
29			+	10			+
March 3	+			11			+
4	+	+		14			+
5	+			23		+	+
6	+			October 5		+	+
22	+			9			+
23	+			15			+
24			+	20			+
30	+						
31	+						
April 1	+						
2	+						
18	+						
19	+						
30	+						
May 1	+						

The filter units taken alone quite frequently yield an effluent, which upon analysis, shows the presence of B. Coli. These several effluents are converged and delivered to the filtered water basin at one point, where, just before the water enters the basin, it is necessary to apply a disinfectant in order to keep the total bacterial count down and secure a water free from B. Coli. It is believed that the process is efficiently maintained, but that the analyses are indicative of results continuously secured is doubtful. At each of the sixty-five sand filters three samples of the effluent are collected daily for analysis to form a basis of operation of the unit.

There was a storm the first week in January 1913, that raised the river stage, increased the turbidity and bacteria of the river water, and was accompanied by

an increase in total bacterial count and the appearance of slightly turbid water in the filtered water basin. On four separate days B. Coli were present in the filtered water. The next storm of any consequence occurred the middle of the month seemingly without having any effect on the quality of the filtered water. In the last third of the month another storm occurred, but no turbidity was noted in the filtered water and on one day B. Coli were present in ten cubic centimeters of the filtered water.

The rainfalls in February appeared to exercise little influence, if, any, upon the stage of the river or the turbidity of the water except at the very last of the month when the river stage was raised, this being accompanied by an increase in the turbidity and bacteria in the river water. No turbidity or B. Coli were present in the filtered water taken from the filtered water basin during this month.

The influence of the rains in the latter part of February extended into the first few days of March when there were an increased total bacterial count and turbid water in the filtered water basin, and on March 4th B. Coli were present in one cubic centimeter of a sample of water collected from this basin.

There was a storm on the 10th of March followed by a very warm rain on the 14th and 15th which raised the stage of the river, brought down turbid water and increased the bacteria in the river. On the 20th of March there was heavy precipitation followed by several days of warm weather and rain fell on the 26th and 27th resulting in a freshet and the highest stage of the river for the year. Corresponding to these warm rains and thaws and the freshet there appeared an increase in the bacteria in the filtered water basin accompanied by appearance of turbidity on March 22nd and 23rd and again on March 30th and 31st.

There was a storm on the 5th of April followed by more turbid river water and a higher bacterial count, but the river stage was not raised until April 12th. On April 11th and 12th heavy precipitation occurred and on the 13th the river had risen 2.7 feet, the turbidity was marked and also the bacterial content of the river water. The storm of April 15th and 16th again raised the bacterial count and turbidity of the river water but it did not increase the stage of the river. This storm, however, was accompanied by a large increase in the bacteria found in samples of the filtered water basin, and on April 18th and 19th the filtered water basin was slightly turbid. In April there was rainfall on fifteen days followed by higher turbidity and bacterial count. On five days the water in the filtered basin was slightly turbid. The effect of the various rains was also seen in this water in a higher total bacterial count. Notwithstanding the various fluctuations of the river during this month no B. Coli were present in the samples of water taken from the filtered water basin.

On the first day of May only was there any turbidity in the filtered water basin as indicated by the samples and at no time during the month were B. Coli present in the samples. There was a storm on the 16th and 17th which apparently exercised little or no influence on either the stage of the river or the quality of the water, but on May 21st to the 24th inclusive there was a storm which raised the river and also increased the turbidity and bacterial count. Again on May 28th there was heavy precipitation, apparently of local influence, the river showing no corresponding manifestation. None of the monthly disturbances and changes in the river water was reflected in the filtered water basin during May.

In June the only rainfall of any account occurred on the 20th, but this did not affect the river stage, but it may have increased the turbidity and bacterial count. During this month turbidity and B. Coli were present in the samples collected from the filtered water basin.

On July 5th there was a local rain followed by an increase in turbidity and total bacterial count. From then on to July 24th there were slight rains on four different occasions apparently without any particular effect on the river. On July 24th there was a big rain followed by a higher stage in the river, but no substantial increase in the turbidity, although the bacterial count increased considerably two days later. The next rain of any consequence occurred on the 29th, but apparently did not exercise any influence on the river water at Torresdale. There was no turbidity in the samples collected in the filtered water basin during this month and all through the month there was a low total bacterial count. On two occasions, the 1st and 9th, B. Coli appeared in ten cubic centimeters of water collected from the filtered water basin but otherwise were absent throughout the month.

In August on eleven days precipitation occurred, but only after the rainfall of August 1st was the river stage affected. The turbidity also increased after this storm. The total bacterial count was highest in the early part of the month and apparently was influenced by some of the rains occurring at that time. In the filtered water basin, however, the total bacterial count was highest during the middle of the month, and on August 21st, 22nd and 23rd respectively with a low river stage and a low total bacterial count in the filter water B. Coli were present in ten cubic centimeters of water collected from the filtered water basin. Only on these three days were there B. Coli found in this basin. Not once during the month was turbidity present in the filtered water basin.

For the month of September the river stage remained very low and was not affected by the precipitation but the turbidities went up on September 7th when there was a storm and again on the 19th following a heavy downpour on the 18th, and also on the 22nd following a precipitation of 1.74 inches on the 21st. On the 23rd of September B. Coli were present, in one C. C. and ten C. C., in samples col-

lected from the filtered water basin. On September 1st, 4th, 7th, 10th, 11th and 14th B. Coli were present in ten C. C. of water collected from the filtered water basin.

There was a big storm the first of October followed by a higher stage of the river, high turbidity and bacteria in the river and an increase of total bacteria in the filtered water basin. On October 5th B. Coli were present in the filtered water basin in one C. C., but not for the rest of the month, although the samples on the 9th, 15th and 20th showed B. Coli present in ten C. C. A big rain occurred on October 12th, 24th and 25th respectively. Following each the river rose, as did the turbidity and bacteria, accompanied by a corresponding increase in the total count in the filtered water basin. Not once during the month did the filtered water appear turbid.

The consumption of water in the Torresdale Water District severely taxes the capacity of the filters at times to yield a sufficient quantity of pure water. If the preliminary treatment of the water were more perfect, the liability of over-taxing the sand filters would be reduced. Either more sand filters must be provided or the pre-treatment of the water perfected or the water district limited to a consumption not greater than that of the present time. Perhaps temporarily this consumption can be reduced by the installation of meters and the prevention of waste. However, the growth of the city must be taken into account, and this will soon overbalance any saving in consumption and makes imperative extensions and improvements at the Torresdale filtration works.

In the following table is shown in million gallons the quantity of water filtered each day at Torresdale during the year 1913 up to November 1st, the table next following showing the average per-capita consumption of water in the Torresdale District. Lardner's Pumping Station draws on the filtered water basin about one foot each day more than is filtered except on Sunday when the basin is filled, so that the Sunday consumption in the table is twelve million gallons or more less and during week days it is two million gallons or so more than the figures given.

Million Gallons Of Water Filtered Daily At Torresdale For 1913, January To October, Inclusive. (Daily records midnight to midnight.)

Day of Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.
1, ...	179	179	186	193	184	*170	200	204	193	194
2, ...	185	*160	*181	194	190	184	200	200	191	195
3, ...	191	167	200	184	194	186	206	*191	200	188
4, ...	195	180	199	182	*182	186	203	204	201	192
5, ...	*191	186	205	183	189	184	197	201	202	*189
6, ...	180	189	202	*178	192	181	*190	204	198	195
7, ...	185	193	209	177	197	177	193	205	*194	199
8, ...	186	197	209	179	196	*177	193	200	203	205
9, ...	192	*171	*197	182	197	187	195	196	203	201
10, ...	185	190	203	186	194	192	198	*194	203	197
11, ...	189	195	202	183	*175	192	197	202	202	191
12, ...	*176	198	198	181	185	194	189	205	197	*182
13, ...	175	200	187	*168	185	191	*181	206	197	193
14, ...	188	201	186	173	197	195	197	208	*197	190
15, ...	188	193	201	183	197	*196	198	207	202	187
16, ...	184	*175	*200	191	188	188	191	200	199	186
17, ...	184	195	192	187	184	197	195	*194	200	182
18, ...	182	201	195	187	*166	200	198	198	196	180
19, ...	*174	197	192	186	180	205	203	199	198	*181
20, ...	168	192	187	*174	188	198	*194	200	194	184
21, ...	181	187	194	180	189	193	203	199	*184	192
22, ...	183	181	194	183	187	*189	199	197	200	192
23, ...	182	*187	*172	181	186	200	203	190	198	192
24, ...	183	203	175	176	183	196	202	*190	202	182
25, ...	177	204	180	186	*174	199	197	201	202	186
26, ...	*169	201	178	190	184	198	189	200	197	*186
27, ...	175	195	178	*182	190	196	*188	201	179	182
28, ...	184	198	181	187	187	194	201	199	*189	186
29, ...	183	.....	174	187	184	*190	204	193	194	183
30, ...	180	.....	*173	185	183	195	208	191	194	183
31, ...	179	.....	189	.....	175	.....	208	*193	.....	182
Average, .	183	190	191	183	188	188	198	199	197	195
Maximum,	195	204	209	194	197	205	209	208	203	205
Minimum, .	168	160	172	168	166	170	181	190	179	180

Daily Averages By Months Of Million Gallons Filtered At Torresdale And Corresponding Per Capita Consumption. (1,698,600 population in district).

Month.	Mil. Gals. daily.	Per Capita.	Month.	Mil. Gals. daily.	Per Capita.
January,	183	167	June,	188	172
February,	190	173	July,	198	180
March,	191	174	August,	199	181
April,	183	167	September,	197	180
May,	188	172	October,	195	178

In the foregoing table the figures starred show the Sunday outputs at the Torresdale filters. The Sunday consumption in the district is about twelve million gallons less than on week days. The filters are manipulated to follow the daily consumption, so Sunday should be the day of least filtered water output, but owing to the filling up of the depleted filtered water basin, this is not always so: still, Sunday is always the day of least consumption. Thursdays, Wednesdays and Tuesdays have been the days of greatest yield during the period of forty-three weeks from January to October inclusive, 1913. Thursday has had the highest yield for eleven weeks, Wednesday for ten weeks and Tuesday for eight weeks, which makes a total of twenty-nine weeks or over two-thirds of the time that the middle week period uses the most water. On five times Monday has been supplied with the maximum yield for the week. Friday on six times and Saturday on three times.

Agitation for the installation of meters to prevent water waste and cut down the consumption has recently impressed the citizens more favorably. However, it is doubtful if for any long period the per capita consumption can be maintained much below 150 gallons. For safety this figure should be used. The installation of meters for a million people is a big undertaking. Besides, the reading of the meters and their care involves much work and a large force of men. If by installing meters a maximum saving of not over thirty million gallons a day is to be effected, it becomes a pertinent question whether it be not a better policy to enlarge and improve the filters. The interest of public health would seem to dictate this.

The months of worst river water, and hence most trouble at the filter plant, are February and March. During the year 1913, January to October inclusive, B. Coli were present in one C. C. the filtered water on January 2nd, March 4th, September 23rd, and October 5th.

While the analyses did not reveal B. Coli in one C. C. during other months of the year 1913, at the filtered water basin, there were periods of turbidity of that water when B. Coli might have been discovered had more representative samples been collected. The periods of turbidity were from January 1st to 6th, inclusive, March 3rd to 6th inclusive, March 22nd and 23rd, and from March 30th to April 2nd, inclusive. Again on April 18th and 19th, and on April 30th and May 1st.

These periods of turbidity and those occurring on or about September 23rd and October 5th may be considered the danger period from water infection due to imperfectly filtered water at the Torresdale Plant, provided such danger periods did actually exist. It is clear that two little samples each twenty-four hours out of two hundred million gallons of filtered water are not representative.

There is lack of evidence with which to sustain an opinion that filtered Torresdale water has been capable, as delivered to the tunnel at the outlet end of the filtered water basin, of causing the typhoid outbreak in Philadelphia this season, but this water might cause such an outbreak for the reasons already stated. It can only be concluded from circumstantial evidence that the water has been reasonably free from contamination. The interests of the public health demand that the disinfection treatment be continued under most careful management and that more samples (preferably a composite sample made up of collections taken every hour out of the twenty-four) be analyzed daily.

It is advisable at this point to define the district served from the Torresdale Plant. Generally speaking, it comprises that part of the city lying east of Broad Street and north of Vine Street, together with an irregularly shaped section of the city extending west of Broad Street to Twenty-seventh Street from Vine Street north to Lehigh Avenue, as well as all of the city territory lying between the two rivers from Vine Street south to and including the League Island Navy Yard From a standpoint of distribution this territory has been divided into several sub-districts Thus in the northern and northeastern part of the city are found the Wentz Farm high and low service districts, south of which covering the rest of the Torresdale distribution territory are the main Torresdale district and a high service district known as the Oak Lane, this latter being the irregularly shaped tract, lying west of Broad Street between Vine Street and Lehigh Avenue, just referred to.

By communities these various sub-districts are further split-up as will appear later in the report. Because of the close association between the typhoid fever outbreak and the public water supply, the discussion of the epidemic as set forth in

this report has been confined to the various water districts of the city and broadly is divided into the Delaware River supply district and the Schuylkill River supply district. The Torresdale or Delaware River supply will first be taken up and followed by a discussion of the various features of the epidemic as relates to the Schuylkill River supply. At times there is some interchange of water between the two districts.

TORRESDALE FILTERED WATER IN THE DISTRIBUTING SYSTEM.

The sub-districts in the Torresdale system are as follows, given in order of location from north to south:

Wentz Farm—High Service.
Wentz Farm—Low Service—Including Frankford.
Oak Lane—High Service.
Main Torresdale—Kensington.
Main Torresdale—Central and South Philadelphia.

WENTZ FARM AND LOW SERVICE DISTRICTS.

The Wentz farm reservoir high service district comprises a part of the 35th Ward and the 42nd Ward. The population of the entire 35th Ward is 10,000 and of the entire 42nd Ward is 24,000. The 35th Ward is the largest one in extent in the City, comprising most of the land in the northeastern section of Philadelphia and extends from Tacony Creek, a tributary of Frankford Creek, to the City line. The southern half of this area is supplied with city water, the larger portion being in the Wentz Farm reservoir Low Service District, and the smaller part being in the High Service. This High Service District is a strip of land bordering Montgomery County and including some of the 42nd Ward south of Tacony Creek. In this High Service District of the 35th Ward, 6,000 persons reside, and in the said district of the 42nd Ward, 3,400 persons reside, making a total of 9,400 in the High Service District.

Into this district and the one next adjoining, namely, the Wentz farm low service district, the Torresdale water first comes by way of the Lardner's Point pumping station. There is a distributing basin known as the Wentz Farm reservoir with an effective capacity of 32,000,000 gallons. Part of the territory is supplied from this basin. Also at the reservoir there is a pumping station and intake connected to the force main from the Lardner's Point Station through which water is raised in a standpipe supplying the various communities lying in the high service district. Among others are the villages of McCartersville and Crescentville in the 42nd Ward and Fox Chase, Verreville, and Bustleton all in the 35th Ward. About two million gallons of water daily are consumed.

The Wentz Farm low service district makes up a comparatively large territory comprising parts of wards 35, 41, 42, 43, and 33, and all of ward 23. The district has a resident population of about 78,000 and includes the well known residential district called Frankford as well as numerous other settlements among which may be mentioned Wissinoning, Olney, Feltonville, Franklinville, Cooperville, and Harrowgate. Directly up-stream from the low service district immediately above Wissinoning, lies Tacony, above which are Holmesburg, Collegeville, and Mt. Pleasant. All of these communities are below the Torresdale filter plant, but do not receive the city water supply, the public supplies being furnished through private corporations.

In the beginning of 1911, about the time filtered water was turned on to the greater part of the present Torresdale District, although the southern portion was still receiving Schuylkill water treated with hypo-chlorite of lime at the Queen Lane reservoir, the City Water Bureau established eight regular water sampling stations located as shown in the following table. In 1913 the city established in addition numerous special sampling stations.

CITY WATER SAMPLING STATIONS—REGULAR.

Present number of Station.	Location.				Size of pipe in inches.
	Ward.	District.	Water.	Station.	
No. 1	41	Wissinoming,	Lardner's Point Station,	Drug Store, Corner Torresdale Ave. & Howell St.	12 off 48.
No. 2	23	Frankford,	Wentz Farm,	D. S. Shaw, Main and Foulkrod Streets,	16 and 20.
No. 5	35	Kensington (Upper Part),	Kensington or Frankford,	Firehouse on Clearfield Street near Frankford Avenue.	Off 12.
No. 8	19	Kensington (Centre),	Kensington,	Front Street and Kensington Avenue, McNeil's Drug Store.	Near 18.
No. 11	31	Kensington (Centre),	Kensington,	Sepviva Street and Cumberland Street, Drug Store.	Off 12.
No. 15	12	Kensington (Lower Part),	Kensington,	712 N. Fifth Street, near Poplar Street, Roosevelt Hospital.	Off 10.
No. 17	6	Callowhill (South),	Lardner's Point Station,	530 Arch Street, Wholesale District Leather store.	Off 18.
No. 26	2	South Philadelphia (South of South Street),	Some Queen Lane,	1000 S. Sixth Street, at Carpenter Street, Head of Passyunk Avenue.	Near submain.

Sampling stations Number One and Number Two are located in the Wentz Farm low service district and the results obtained from analysis of samples collected at these stations as well as those at numerous special stations throughout the district have a bearing on the discussion of the typhoid fever situation in these two water districts.

Total count determinations have been made at Station Number One for the last three years. B. Coli determinations were started on December 12th, 1912, and have since been continued. The monthly average, maximum and minimum counts, and the number of times B. Coli were present in ten C. C. are given in the following table; for the three years. B. Coli in one C. C. were not found. The table of results follows:

RESULTS OF ANALYSES OF TORRESDALE FILTERED WATER AT STATION NO. 1.

	1911			1912.					1913.				
	Total Counts.			Total Counts.			Times B. Coli Present.	No. of Samples Taken.	Total Counts.			Times B. Coli Present.	No. of Samples Taken.
Month.	Ave.	Max.	Min.	Ave.	Max.	Min.	10 C. C.		Ave.	Max.	Min.	10 C. C.	
January,	19	50	6	14	76	2	.....	.....	21	250	1	2	26
February,	32	140	10	99	575	1	.....	.....	6	22	1	0	21
March	10	18	3	61	175	12	.....	.....	15	105	1	2	28
April,	13	15	6	18	40	8	.....	.....	9	80	1	0	25
May,	13	27	3	12	22	5	.....	.....	5	10	1	0	14
June,	31	225	10	13	20	10	.....	.....	7	10	4	0	13
July,	15	70	5	13	55	1	.....	.....	15	56	6	0	12
August,	56	238	5	7	8	3	.....	.....	10	40	2	0	13
September,	74	175	15	8	15	3	.....	.....	11	15	4	3	11
October,	45	250	10	9	50	1	.....	.....	10	25	3	1	11
November,	97	310	10	13	45	1	.....	.....					
December,	16	40	5	14	65	3	1	14					

So of 188 samples B. Coli were present in ten C. C. in nine samples. The total count in these nine samples was low. In two of them the count was ten or less, in four of them the count was twenty or less and in eight of them the count was thirty or less. One had a total count of a hundred ten. This was on March 6th when the river conditions were normal. Hence the water seems to have been good at Station Number One. Incidentally it may be mentioned that in Ward 41, whose population is 16,640, the typhoid cases during the last three years have been few, distributed as follows: In 1911 six cases, in 1912 seven cases, and 1913 two cases.

Before the water reaches city sampling station Number One it has to pass through the pumps at Lardner's Point Station. Samples are collected every day, Sundays excepted. From January to October inclusive out of 255 samples collected from the force main at the pumping station, three only showed the presence of B. Coli in one C. C. The total counts were low. In thirty-three samples the presumptive Coli were found by the Bureau of Water analyst in ten C. C. The table below shows the results of analyses of tap samples at Lardner's Pumping Station:

RESULTS OF ANALYSES OF TORRESDALE FILTER WATER FROM TAP AT LARDNER'S PUMPING STATION, 1913.

Day.	January.			February.			March.			April.			May.		
	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.
1,	.....	.....	.....	6	.....	.....	.....	.....	.....	12	.....	.....	7	.....	.....
2,	20	+	+	.....	.....	.....	.....	.....	.....	8	.....	.....	8	.....	.....
3,	58	.....	+	2	.....	.....	20	.....	.....	12	.....	.....	13	.....	.....
4,	17	.....	.....	38	.....	.....	10	.....	.....	6	.....	.....	.....	.....	.....
5,	.....	.....	.....	8	.....	.....	12	.....	.....	8	.....	.....	6	.....	.....
6,	24	.....	+	4	.....	.....	120	.....	.....	.....	.....	.....	5	.....	.....
7,	12	.....	.....	2	.....	.....	8	.....	.....	4	.....	.....	6	.....	.....
8,	8	.....	.....	15	.....	.....	9	.....	.....	3	.....	.....	6	.....	.....
9,	4	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	6	.....	.....
10,	16	.....	.....	4	.....	.....	4	.....	.....	6	.....	.....	3	.....	.....
11,	10	.....	.....	4	.....	.....	4	.....	.....	4	.....	.....	.....	.....	.....
12,	.....	.....	.....	—	.....	.....	5	.....	.....	4	.....	.....	2	.....	.....
13,	6	.....	.....	2	.....	.....	4	.....	.....	.....	.....	.....	1	.....	.....
14,	6	.....	.....	3	.....	.....	4	.....	.....	6	.....	.....	2	.....	.....
15,	11	.....	.....	5	.....	.....	6	.....	.....	12	.....	.....	1	.....	.....
16,	3	.....	.....	—	.....	.....	.....	.....	.....	8	.....	.....	1	.....	.....
17,	4	.....	.....	2	.....	.....	1	.....	.....	18	.....	.....	4	.....	.....
18,	6	.....	.....	6	.....	.....	1	.....	.....	66	.....	.....	.....	.....	.....
19,	.....	.....	.....	3	.....	.....	6	.....	.....	11	.....	.....	4	.....	.....
20,	11	.....	.....	4	.....	.....	12	.....	.....	.....	.....	.....	2	.....	.....
21,	4	.....	.....	4	.....	.....	—	.....	.....	8	.....	+	1	.....	.....
22,	6	.....	.....	—	.....	.....	21	.....	.....	7	.....	.....	0	.....	.....
23,	4	.....	.....	2	.....	.....	.....	.....	.....	4	.....	.....	3	.....	.....
24,	4	.....	.....	2	.....	.....	16	.....	.....	2	.....	.....	2	.....	.....
25,	6	.....	.....	1	.....	.....	10	.....	.....	4	.....	.....	.....	.....	.....
26,	.....	.....	.....	3	.....	.....	7	.....	.....	4	.....	.....	2	.....	.....
27,	2	.....	.....	7	.....	.....	4	.....	.....	.....	.....	.....	2	.....	.....
28,	4	.....	+	11	.....	.....	10	.....	.....	5	.....	.....	2	.....	.....
29,	20	.....	+	.....	.....	.....	8	.....	.....	4	.....	.....	5	.....	.....
30,	4	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	—	.....	.....
31,	20	.....	.....	.....	.....	.....	26	.....	.....	.....	.....	.....	4	.....	.....

RESULTS OF ANALYSES OF TORRESDALE FILTER WATER FROM TAP AT LARDNER'S PUMPING STATION, 1913—Continued.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Total Count.	B. Coli. 1 C. C.	B. Coli. 10 C. C.
1,	.....	.....	.....	4	.....	.....	2	.....	.....	—	.....	.....	13	.....	.....
2,	3	.....	.....	12	.....	+	5	.....	.....	2	.....	.....	16	.....	.....
3,	6	.....	.....	4	.....	.....	.....	.....	.....	5	.....	.....	30	.....	+
4,	6	.....	.....	—	.....	.....	2	.....	.....	4	.....	+	32	.....	.....
5,	2	.....	.....	6	.....	.....	2	.....	.....	4	.....	+	.....	.....	.....
6,	8	.....	.....	.....	.....	.....	2	.....	.....	13	.....	+	20	.....	.....
7,	6	.....	.....	6	.....	.....	3	.....	.....	—	.....	.....	21	.....	.....
8,	.....	.....	.....	6	.....	.....	4	.....	.....	4	.....	+	24	.....	+
9,	5	.....	.....	10	.....	.....	2	.....	.....	4	.....	+	20	.....	+
10,	4	.....	.....	10	.....	.....	.....	.....	.....	8	.....	+	26	.....	.....
11,	0	.....	.....	2	.....	+	3	.....	.....	12	.....	.....	9	.....	.....
12,	3	.....	.....	4	.....	.....	5	.....	.....	12	.....	+	.....	.....	.....
13,	4	.....	.....	.....	.....	.....	2	.....	.....	4	.....	.....	11	.....	.....
14,	4	.....	.....	7	.....	.....	3	.....	.....	.....	.....	.....	8	.....	.....
15,	.....	.....	.....	4	.....	.....	26	.....	.....	4	.....	+	10	.....	.....
16,	6	.....	.....	4	.....	+	34	.....	+	9	.....	.....	18	.....	+
17,	6	.....	.....	4	.....	.....	.....	.....	.....	6	.....	.....	13	.....	.....
18,	2	.....	.....	4	.....	.....	6	.....	.....	3	.....	.....	6	.....	.....
19,	7	.....	.....	4	.....	+	4	.....	+	2	.....	.....	.....	.....	.....
20,	4	.....	.....	.....	.....	.....	35	.....	.....	12	.....	.....	11	.....	.....
21,	6	.....	.....	2	.....	.....	14	.....	+	.....	.....	.....	2	.....	.....
22,	.....	.....	.....	2	.....	.....	25	+	+	4	.....	.....	6	.....	.....
23,	6	.....	.....	4	.....	.....	12	.....	.....	12	.....	+	2	.....	.....
24,	3	.....	.....	4	.....	.....	.....	.....	.....	8	+	+	2	.....	.....
25,	4	.....	.....	4	.....	.....	13	.....	.....	6	.....	+	1	.....	.....
26,	6	.....	.....	6	.....	.....	4	.....	.....	3	.....	.....	.....	.....	.....
27,	1	.....	.....	.....	.....	.....	4	.....	.....	8	.....	.....	9	.....	.....
28,	6	.....	.....	4	.....	.....	4	.....	.....	.....	.....	.....	8	.....	+
29,	.....	.....	.....	1	.....	.....	6	.....	.....	1	.....	+	8	.....	.....
30,	4	.....	.....	4	.....	.....	8	.....	.....	7	.....	.....	8	.....	.....
31,	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....

Thus the B. Coli appeared three times during the year in one cubic centimeter and thirty-three time in ten cubic centimeters.

If B. Coli are present in ten cubic centimeters it may be argued that the water is not safe. The query is whether the typhoid organism pass where B. Coli pass. If so then typhoid infection may to some extent be in the water containing B. Coli in ten cubic centimeters. During the month of September, 1913, twelve out of twenty-five samples showed B. Coli in ten cubic centimeters. On September 23rd at the filtered water basin at Torresdale B. Coli were present in one and in ten cubic centimeters, and on the following day they were present in one and in ten cubic centimeters at Lardner's pumping station. At the filtered water basin from September 4th to 14th inclusive there were five days when B. Coli were present in ten cubic centimeters. For the same period, and adding September 15th, B. Coli in ten cubic centimeters were present at Lardner's pumping station on eight days. The application of hypochlorite of lime at Torresdale is the agency that keeps the B. Coli down. The methods of application cannot be relied upon for absolute results. The conclusion is that for public safety the filters should be made more efficient. It should not be stated that Torresdale water is absolutely pure. It is reasonable safe for all purposes except drinking. For absolute safety the people who drink this water should resort to the boiling of it until extensions and improvements to the filter plant shall have been made.

In the months of September and October heavy precipitation occurred. The filters were rapidly clogged at Torresdale necessitating more frequent cleaning. The Delaware brings down a lot of fibrous material that is difficult to handle at the plant. In consequence B. Coli appeared in the filtrate at Torresdale and at Lardner's Point. The dose of hypochlorite of lime was increased at the filtered water basin. Lardner's Point pumping station water is supposed to be represented at Sampling Station No. 1. The State Health Department made its own collection and analyses of water at this station and found that out of twenty samples collected in October two contained B. Coli in one cubic centimeter, the actual counts being made and one being present in each of these two samples. The other eighteen samples showed a pure water by this standard. The results of such analyses are shown in the following table:

RESULTS OF STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES OF FILTERED WATER COLLECTED AT SAMPLING STATION NUMBER 1 AT 5900 TORRESDALE AVENUE —CORNER HOWELL STREET.

October.	Bacteria per Cubic Centimeter.		
1913.	Total.	Pink Colonies.	B. Coli.
10	60	0	0
11	80	1	1
Sun. 12	10	0	0
13	24	0	0
14			
15	60	1	0
16	100	0	0
17	45	1	1
18	50	0	0
Sun. 19	100	0	0
20	30	0	0
21	18	0	0
22	10	0	0
23	18	0	0
24	23	0	0
25	6	0	0
Sun. 26			
27	20	0	0
28	19	0	0
29	16	0	0
30	28	0	0
31	24	0	0

In the immediate vicinity of Station No. 1 during the first part of the year two special stations for testing filtered water were established by the city in the 41st Ward within a block or so of Station No. 1. They are numbered Stations Nos. 9 and 10 respectively.

Station No. 9 was at 3521 Benner Street. It was started January 2nd and discontinued February 15th, thirty-eight samples being collected on thirty-eight days. No B. Coli in one or ten cubic centimeters present. In the following table the results are given:

RESULTS OF ANALYSES OF TORRESDALE WATER—CITY SPECIAL SAMPLING STATION NO. 9.—3521 BENNER STREET. WATER TAKEN OFF 48 INCH MAIN FROM LARDNER'S PUMPING STATION. STARTED JANUARY 2, 1913.

Jan.	Total Bacteria.	B. Coli. 1 C. C.	B. Coli. 10 C. C.	Feb.	Total Bacteria	B. Coli. 1 C. C.	B. Coli. 10 C. C.
1				1	6	—	—
2	230	—	—	Sun. 2			
3	1	—	—	3	10	—	—
4	30	—	—	4	10	—	—
Sun. 5				5	11	—	—
6	11	—	—	6	3	—	—
7	6	—	—	7	10	—	—
8	6	—	—	8	5	—	—
9	8	—	—	Sun. 9			
10	120	—	—	10	3	—	—
11	140	—	—	11	4	—	—
Sun. 12				12	—	—	—
13	8	—	—	13	10	—	—
14	2	—	—	14	4	—	—
15	4	—	—	15	14	—	—
16	8	—	—				
17	2	—	—				
18	9	—	—				
Sun. 19							
20	52	—	—				
21	20	—	—				
22	32	—	—				
23	40	—	—				
24	16	—	—				
25	37	—	—				
Sun. 26							
27	6	—	—				
28	110	—	—				
29	24	—	—				
30	15	—	—				
31	10	—	—				

Station No. 10 was at Torresdale Avenue and Higbee Street, being started on February 17th and discontinued April 5th. Out of forty samples none contained B. Coli in one cubic centimeter. One sample contained B. Coli in ten cubic centimeters. The results are given in the following table:

RESULTS OF ANALYSES OF TORRESDALE WATER—CITY SPECIAL SAMPLING STATION NO. 10.—TORRESDALE AVENUE AND HIGBEE STREET. WATER TAKEN OFF 48 INCH MAIN FROM LARDNER'S POINT PUMPING STATION. STARTED FEBRUARY 17, 1913.

Feb.	Total Bac.	B. Coli. 1 C.C.	B. Coli. 10 C.C.	Mar.	Total Bac.	B. Coli. 1 C.C.	B. Coli. 10 C.C.	Apr.	Total Bac.	B. Coli. 1 C.C.	B. Coli. 10 C.C.
1				1	4	—	—	1	17	—	—
2				2				2	12	—	—
3				3	11	—	—	3	9	—	—
4				4	8	—	—	4	7	—	—
5				5	9	—	—	5	16	—	—
6				6	120	—	+				
7				7	8	—	—				
8				8	10	—	—				
9				9							
10				10	7	—	—				
11				11	3	—	—				
12				12	2	—	—				
13				13	2	—	—				
14				14	7	—	—				
15				15	7	—	—				
16				16							
17	7	—	—	17	3	—	—				
18	2	—	—	18	7	—	—				
19	8	—	—	19	17	—	—				
20	4	—	—	20	10	—	—				
21	6	—	—	21							
22				22	29	—	—				
23	4	—	—	23							
24	1	—	—	24	17	—	—				
25	2	—	—	25	10	—	—				
26	1	—	—	26	3	—	—				
27	5	—	—	27	6	—	—				
28				28	7	—	—				
				29	11	—	—				
				30							
				31	4	—	—				

Comly Street extends perpendicularly back from the Delaware River through the centre of Wissinoming between Howell and Benner Streets. On Comly Street three testing stations were established by the City Water Bureau the first of October but were abandoned because the water collected here upon analysis was found to be the same as at Station No. 1. The results are given in the following table:

RESULTS OF ANALYSES OF TORRESDALE WATER FROM CITY SPECIAL SAMPLING STATIONS ON COMLY STREET.

Date.	Comly St. & Delaware Ave.			Comly St. & State Rd.			Comly & Jackson Sts.		
	Bacteria.			Bacteria.			Bacteria.		
	Total.	B. Coli.		Total.	B. Coli.		Total.	B. Coli.	
		1 C.C.	10 C.C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.
Oct. 2	51	—	—	13	—	—			
Oct. 6	7	—	—	6	—	—	11	—	—
Oct. 8	17	—	+	10	—	+	18	—	—

Summarizing briefly:—Out of 535 samples of the Torresdale water collected in 1913 at the several testing stations and the Lardner's Point pumping station, all being in the district in the 41st Ward known as Wissinoming, five only of the samples showed the presence of B. Coli in one cubic centimeter. This is taken by the analysts of the City Board of Health and of the City Water Bureau to indicate a good and safe water. Considering that the total counts are low and that no cases of typhoid fever have occurred in this district in 1913 (the two cases in the 41st Ward being outside of this territory and remote) it would appear that the city water has not been the means of transmitting typhoid in this district.

Total count determinations have been made at City Sampling Station No. 2.—Main and Foulkrod Streets—Frankford Centre—for the last three years. Many of the water pipes in Frankford and Wissinoming are old. The district was first supplied with public water in 1877 when the Frankford pumping station and Wentz Farm reservoir were completed. Wissinoming now receives water direct from Lardner's Point pumping station and Frankford gets Wentz Farm reservoir water. B. Coli determinations have also been made at Station No. 2. The results are shown in the following table:

RESULTS OF ANALYSES OF TORRESDALE WATER AT CITY SAMPLING STATION NO. 2.

	1911.						1912.						1913.					
	Total Count.			Times B. Coli Present.		No. of samples taken for B. Coli.	Total Count.			Times B. Coli Present.		No. of samples taken for B. Coli.	Total Count.			Times B. Coli Present.		No. of samples taken for B. Coli.
Month.	Ave.	Max.	Min.	1 CC.	10 CC.		Ave.	Max.	Min.	1 CC.	10 CC.		Ave.	Max.	Min.	1 CC.	10 CC.	
Jan., ...	34	100	8	0	1	9	59	180	15	0	0	9	56	88	25	0	0	8
Feb., ...	86	180	14	1	1	6	148	715	8	0	0	7	31	80	5	0	0	7
Mar., ..	16	40	12	0	0	9	380	1,200	30	0	1	8	88	220	15	0	0	9
Apr., ...	23	42	10	0	0	8	114	550	15	0	0	9	83	220	30	0	1	9
May, ...	21	32	13	0	0	10	32	60	15	0	3	9	39	130	12	0	0	10
June, ..	258	2,000	12	0	0	9	63	250	10	0	2	7	913	7,300	12	0	1	13
July, ...	91	650	15	1	3	9	41	140	10	0	0	10	91	220	33	0	0	13
Aug., ..	211	440	22	1	2	9	136	320	28	1	3	7	277	1,500	37	1	1	13
Sept., ..	121	290	58	2	2	7	66	120	18	0	0	8	61	220	8	0	1	12
Oct., ...	112	200	36	3	3	9	72	100	30	0	0	9	144	270	64	0	1	13
Nov., ...	87	175	38	3	7	9	66	105	38	0	1	8	.....	.....	.....	.....	.....	.....
Dec., ...	31	63	5	0	2	7	48	90	20	0	0	8	.....	.....	.....	.....	.....	.....

The total counts at this station run consistently higher than at Station No. 1. The samples are collected off the twenty inch main leading from Wentz Farm reservoir which is an open basin, earth embankment, sides and bottom lined with brick supporting some water grass growth. There is said to be about three feet of sediment. The reservoir holds about thirty-eight million gallons when full but its usual capacity is 32,000,000 gallons. The city does not collect samples regularly from this basin. The results of the Department's analyses are given in the following table:

STATE DEPARTMENT OF HEALTH ANALYSES OF WENTZ FARM RESERVOIR WATER —1913.

Date of Collection.	Bacteria per c. c.		
	Total.	Pink Colonies.	B. Coli.
Oct. 26	150	1	0
27	48	1	0
28	350	3	0
29	300	0	0
30	130	0	0
31	100	2	1

On June 9th, 1911, the Wentz Farm reservoir was treated with copper sulphate to destroy algae. There is a large group of spore forming and resistive water bacteria in the Wentz Farm reservoir water that are at once nourished by the dead algae. They multiply enormously and they made their appearance at Station No. 2 in 1911 in the samples collected June 12th and 14th and 16th respectively.

This phenomenon was manifest again on June 2nd, 1913, the day following an application of copper sulphate at the Wentz Farm reservoir. The total counts at Station No. 2. were as follows:

June 2nd, ...Total Bacteria 7,300 and no B. Coli.
June 4th, ...Total Bacteria 2,500 and no B. Coli.
June 6th, ...Total Bacteria 1,500 and no B. Coli.

The water was good at points above. At Station No. 1, at Lardner's pumping station, and at the Torresdale filtered water basin there were no B. Coli present on June 2nd nor in any samples collected daily for ten days before or after June 2nd, and for this period of twenty-one days the total count at these places did not exceed ten.

The State Department of Health collected samples at two stations at Frankford One was at the Arrot Street Railroad Station in the northwestern part of Frankford and the other was in the eastern section near the main line of the Pennsylvania Railroad. Out of nineteen samples from the former station only one showed B. Coli present, and out of twenty samples at the latter place, not one showed B. Coli. Station No. 2. lies between these two State stations. For October the results are comparable for all three.

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES OF FILTERED WATER COLLECTED AT ARROT STREET, PHILADELPHIA & READING RAILWAY STATION, FRANKFORD, 1913.

October.	Bacteria per C. C.		
	Total.	Pink Colonies.	B. Coli.
11	40	0	0
12	29	0	0
13	40	0	0
14	.....	.....	.....
15	100	0	0
16	80	0	0
17	20	0	0
18	40	0	0
19	30	0	0
20	40	0	0
21	60	0	0
22	48	0	0
23	27	0	0
24	10	0	0
25	24	0	0
27	19	0	0
28	80	1	1
29	28	0	0
30	41	0	0
31	25	0	0

Arrot Street Station is about half a mile west of City Sampling Station No. 2. It will be noted that at City Station No. 2, for the year 1913, out of 106 samples in one only were B. Coli present, this happening on the 11th day of August, and five times during the year, up to November 1st, B. Coli were found in ten cubic centimeters. The difference in the two waters is marked in the total count. Arrot Street is in a newly developed neighborhood.

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT STATE ROAD AND MARGARET STREET—TWENTY-THIRD WARD—OLD FRANKFORD DISTRICT —1913.

October.	Bacteria per C. C.		
	Total.	Pink colonies.	B. Coli.
10	60	0	0
11	10	0	0
12	23	0	0
13	17	0	0
14	.....	.....	.....
15	18	0	0
16	100	0	0
17	80	1	0
18	36	0	0
19	9	0	0
20	20	0	0
21	9	0	0
22	10	0	0
23	4	0	0
24	6	0	0
25	12	0	0
26	.....	.....	.....
27	21	0	0
28	42	0	0
29	24	0	0
30	12	0	0
31	20	0	0

There is little to choose between the waters of these two State testing stations

About three-quarters of a mile southwest of the above station, where the main line of the Pennsylvania Railroad crosses Frankford Creek, the City Water Bureau has had a special testing station during the summer of 1913. These samples represent water in the distributing pipes in the southern portion of Frankford. By reference to the following table it will be noted that the samples collected on June 2nd, 4th and 6th respectively corresponded in high total count to those collected on the same date at City Station No. 2. Both were Wentz Farm reservoir water. At this special station—No. 3—the water shows the presence of B. Coli at more frequent intervals.

CITY SPECIAL SAMPLING STATION NO. 3, TACONY AND LEWIS STREETS—TWENTY-THIRD WARD, 1913.

Day.	June.			July.			August.			September.			October.		
	Bacteria.			Bacteria.			Bacteria.			Bacteria.			Bacteria.		
		B. Coli			B. Coli			B. Coli.			B. Coli.			B. Coli.	
	Total.	1 C. C.	10 C. C	Total.	1 C. C.	10 C. C.	Total.	1 C. C.	10 C. C.	Total.	1 C. C.	10 C. C.	Total.	1 C. C.	10 C. C.
1,	.....	.....	.....	.....	.....	.....	25	—	+	.....	.....	.....	.....	.....	.....
2,	1,400	—	—	14	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
3,	.....	.....	.....	.....	.....	.....	.....	.....	.....	160	—	+	.....	.....	.....
4,	1,000	—	+	.....	.....	.....	150	—	—	.....	.....	.....	.....	.....	.....
5,	.....	.....	.....	.....	.....	.....	.....	.....	.....	59	+	+	.....	.....	.....
6,	560	—	+	.....	.....	.....	88	+	+	.....	.....	.....	54	—	—
7,	.....	.....	.....	110	—	+	.....	.....	.....	100	—	+	.....	.....	.....
8,	.....	.....	.....	.....	.....	.....	140	—	—	.....	.....	.....	180	—	+
9,	55	—	—	62	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
10,	.....	.....	.....	.....	.....	.....	.....	.....	.....	88	+	+	220	+	+
11,	56	+	+	52	+	+	220	—	—	.....	.....	.....	.....	.....	.....
12,	.....	.....	.....	.....	.....	.....	.....	.....	.....	41	—	+	.....	.....	.....
13,	45	—	+	.....	.....	.....	100	—	—	.....	.....	.....	100	—	+
14,	.....	.....	.....	26	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
15,	.....	.....	.....	.....	.....	.....	54	—	—	86	—	—	47	—	+
16,	13	—	—	28	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
17,	.....	.....	.....	.....	.....	.....	.....	.....	.....	39	—	—	39	—	+
18,	.....	.....	.....	33	—	+	98	—	—	.....	.....	.....	.....	.....	.....
19,	28	—	—	.....	.....	.....	.....	.....	.....	110	—	—	.....	.....	.....
20,	50	—	—	.....	.....	.....	380	—	+	.....	.....	.....	81	—	—
21,	.....	.....	.....	54	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
22,	.....	.....	.....	.....	.....	.....	37	—	+	220	—	—	200	—	+
23,	40	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24,	.....	.....	.....	.....	.....	.....	.....	.....	.....	63	—	+	52	—	+
25,	280	+	+	35	—	—	540	—	—	.....	.....	.....	.....	.....	.....
26,	.....	.....	.....	.....	.....	.....	.....	.....	.....	41	—	—	.....	.....	.....
27,	18	—	+	.....	.....	.....	62	—	—	.....	.....	.....	100	—	—
28,	.....	.....	.....	110	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
29,	.....	.....	.....	.....	.....	.....	25	—	—	65	—	—	56	—	—
30,	13	—	—	61	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
31,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	64	—	—

By comparing the results of analyses of the samples collected at Station Nos. 1, 2, and 3, it will appear that the last two, representing Wentz Farm reservoir water, are much inferior. Station No. 1 represents the water fresh from Lardner's Point pumping station and the Torresdale filter plant. By reference to the next two tabular statements it may be seen that the average count at No. 1 is 10, while at Stations Nos. 2 and 3 for the months comparable—June to October inclusive—the average count for No. 2 is 297 and for Station No. 3 it is 120. No B. Coli in one cubic centimeter were found at Station No. 1 for the period, once they were present at No. 2, and eight times they were found at No. 3.

COMPARISON OF AVERAGE TOTAL COUNTS AT CITY STATIONS NOS. 1, 2, AND 3 FOR 1913.

	June.	July.	Aug.	Sept.	Oct.	Average.
Station No. 1, ...	7	15	10	11	10	10
Station No. 2, ...	913	91	277	61	144	297
Station No. 3, ...	273	53	147	90	39	120

COMPARISON OF B. COLI AT CITY STATIONS NOS. 1, 2, AND 3—1913.

	Number of Times Appearing.											
	June.		July.		Aug.		Sept.		Oct.		Total.	
	1CC	10CC	1CC	10CC	1CC	10CC	1CC	10CC	1CC	10CC	1CC	10CC
1, ...	0	0	0	0	0	0	0	3	0	1	0	4
2, ...	0	1	0	0	1	1	0	1	0	1	1	4
3, ...	3	6	1	4	1	4	2	6	1	7	8	27

A special testing station, tap in the public school, was started by the city in October and continued for a few days at Orthodox and Penn streets, Twenty-third Ward. The counts were high but no B. Coli were found. The results are given below in tabulated form.

CITY SPECIAL STATION, ORTHODOX AND PENN STREETS.

October.	Bacteria.		
		B. Coli.	
	Total.	1 C. C.	10 C. C.
6, ...	770	—	—
8, ...	110	—	—
10, ...	150	—	—
13, ...	220	—	—
15, ...	220	—	—
17, ...	140	—	—
20, ...	330	—	—

Eight State Department of Health check-up stations were scattered throughout the Twenty-third Ward and samples collected for three days the analyses revealing nothing not shown by other samples.

STATE DEPARTMENT OF HEALTH CHECK-UP SAMPLING STATIONS IN VARIOUS PARTS OF TWENTY-THIRD WARD—1913.

Station.	October 2.			October 6.			October 8.		
	Bacteria.			Bacteria.			Bacteria.		
		B. Coli			B. Coli			B. Coli	
	Total	1CC	10CC	Total	1CC	10CC	Total	1CC	10CC
A Fitler's Cordage Works,	16	—	+	6	—	—	15	—	—
B State Road and Bridge St.,	12	—	—	11	—	—	13	—	—
C State Road and Wakeling St.,	11	—	+	8	—	—	23	—	+
D State Road and Margaret St.,	10	—	—	9	—	—	16	—	—
E Arrot Street Station,	.....	.....	.....	50	—	—	14	—	—
F Frankford Ave. and Bridge St.,	.....	.....	.....	18	—	—	12	—	—
G Walker and Bridge Sts.,	.....	.....	.....	20	—	—	9	—	—
H Jackson and Wakeling Sts.,	.....	.....	.....	9	—	—	30	—	+

The State Department of Health analyzed a sample fom Orthodox and Penn streets, collected October 10th and found four B. Coli to the cubic centimeter.

Summarizing the result of the season's tests of water in the Frankford District, it will be seen from the following table that forty-three samples were collected the first five months and the water was good. B. Coli were absent in one cubic centimeter. In the next five months 197 samples were collected and the water was bad.

RESULTS OF ANALYSES OF TORRESDALE WATER SUMMARY OF 1913 SAMPLES IN THE TWENTY-THIRD WARD—FRANKFORD DISTRICT.

Month.	No. of samples taken.	Number of times B. Coli were present.		
		In 1 C. C.	In 10 C. C.	
January,	8	0	0	
February,	7	0	0	
March,	9	0	0	43 samples
April,	9	0	1	
May,	10	0	0	
June,	26	3	7	
July,	23	1	4	
August,	26	2	5	197 samples
September,	24	2	7	
October,	98	4	12	
Total,	240	12	36	

Eight of the samples showing B. Coli in 1 C. C. and twenty-seven samples with B. Coli in 10 C. C. came from water collected at Station No. 3. One object of this station was to detect any pollution from dual water service pipes at manufacturing establishments. There were three such dual services, the first being on Frankford Creek and the other two along the State road:—Barrett Manufacturing Co., Margaret and Bermuda streets; Philadelphia Cordage Works, State Road below Van Kirk street, and Quaker City Rubber Co., Comly and Milnor streets.

The Barrett Manufacturing Company, manufacturers of coal tar products, employs two hundred men. No sickness among the men. There was a six inch city connection to a pump lifting raw water from Frankford creek for fire service. The connection was severed September 4th, 1913. Now city water is used for

drinking and boilers, and can be discharged into the pump well from which the service pumps raise it, there no longer being any connection other than the pump well between the two services.

The Cordage Works employs five hundred men. River water is used for fire and manufacturing purposes, an artesian well for drinking. There were two six inch fire connections off the city mains. On October 3rd, 1913, the company was preparing to cut off the city supply absolutely within a day or so, and to rely entirely upon the river water and artesian well. There is a valve and a check on the connection. Every Friday, under test, pressure on raw water lines runs up to one hundred pounds. At such times there might be a leakage to the city lines There was a fire, the fire pump being in service one hour, Sunday afternoon June 1st, 1913.

The Quaker City Rubber Company employs three hundred men; no sickness reported among employees. The river water is used for factory and fire lines. A fire pump raises this water to a tank on the roof, whence it flows by gravity throughout the works. When the fire pump is operated it gives a pressure of one hundred pounds. There was a direct connection between the fire pump and the city pipe line, the valve on this line normally being left open, with only a check intervening. On September 24th, 1913, the valve was shut. Probably some river water leaked through the check into the city pipe. This would be more likely to occur when the fire pumps were in operation, for testing or any other purpose. The company agreed to install a large tank, in conformity with the city's order, and bring about an absolute severance of the two systems.

There are three other dual services up Pennypack Creek that might have polluted the water in this district: Horrocks & Brother, Dye Works, Asylum Pike and Unity street; MacGowan & Sons, Church and Adams streets; Eastlake Manufacturing Co., Leiper street and Adams avenue.

Horrocks & Brother, dyers of cotton yarns and fabrics, employ forty men. None has been ill. They have a two inch city service pipe for boilers and bleaching room. A pond nearby was used as a source of water supply for ordinary purposes. When the pond is low it is filled with city water. Direct connection existed between raw and city pipe lines. On September 22nd the connection was severed.

McGowan & Sons employ about two hundred men, nine of whom has been ill. There was a one inch connection between the city and creek pipes. City water was used for boiler feed and drinking, creek water for condensing. On September 15th the cross connection was severed. Very little if any pollution ever escaped from this place into the city mains.

The Eastlake Manufacturing Company employs a maximum of a thousand men No illness among them. A ten inch suction from Frankford Creek was used to obtain water for fire and sprinkling system. A four inch and a two inch city pipe were cross connected to the raw water line, but these connections were severed October 4th, the city water being delivered into an artesian well chamber.

The worst offender of all was the Illingworth Steel Co., near Lewis and Ashland streets, close to City Sampling Station No. 3; 150 men are employed. No sickness among them. There was a four inch city water connection and also a six inch intake to a reservoir supplied with artesian well water, which is pumped to the works when the city pressure is inadequate. There was a direct connection from the pump discharge to the city main and the company admits pumping raw water into the city mains on more than one occasion two years ago.

Other manufacturing plants take water from the city line running into the steel plant. They operate during the day only, while the steel company runs twenty-four hours a day. When the other plants are drawing water from the line the pressure at Illingworth's is about twelve pounds. In the night time the pressure goes up and is adequate except for fires. The evidence indicates that the valve on the city pipe line connection to the pump force main was opened quite often, and that the city water was boosted throughout the plant. Consequently some of the reservoir water would be likely to get into the city pipe system and show at City Sampling Station No. 3, unless the water in the reservoir were as pure as the city filtered water.

With respect to the dual pipe services in the district tributary to City Sampling Station No. 3, it may be concluded that any pollution caused thereby would appear in the city mains intermittently. The proprietors of the industries all maintain that no contamination has occurred due to their operations. Had any general contamination of the city water taken place it is believed it would have shown up in a sufficiently marked manner to be recognized. The evidence presented by Station No. 3 samples is not sufficient to state decidedly that the dual connections produced the B. Coli in the city water.

In 1913 in the Twenty-third Ward, which has a population of 32,133, there have been ten cases of typhoid fever, fourteen for the year 1912, and twenty for the year 1911, distributed monthly as follows:

TYPHOID FEVER CASES IN THE TWENTY-THIRD WARD—FRANKFORD DISTRICT.

Month	1911	1912	1913
January,	1	1	3
February,	0	1	1
March,	2	0	0
April,	0	0	0
May,	0	0	0
June,	0	2	2
July,	1	1	1
August,	2	2	1
September,	8	3	1
October,	2	1	1
November,	2	2	
December,	2	1	
Total,	20	14	10

Four of the ten cases occurring in 1913 had onsets in the first five months of the year when the samples showed good city water, and one of these cases is questionable as to diagnosis.

Of the six cases occurring in the next five months, one was a river bather, one was imported, and the other three were distributed in June, August, and October. The October case ate freely of raw lettuce from a truck farm in Richmond where night soil is quite generally used by the farmers for fertilization.

There are in the Richmond District twenty-two licensed poudrette pits. Under a late regulation the night soil is required to be composted and then stored for two years. Until recently the excrement, mixed with lime, manure, and earth, was taken out every spring and used. The new State law, regulating night soil disposal, does not go into effect until January, 1914. The State Department of Health officers visited fifty-two of the sixty poudrette pits licensed by the City Board of Health. Evidence was seen of some direct application of fresh night soil to the growing vegetables. In Richmond, fifteen farmers use night soil and four do not use it. The City Health authorities would like to declare all poudrette pits a nuisance and close them up, but at present there is no other way provided to dispose of the material.

In 1912 Dr. Joseph S. Neff, for the city, presented to the State Commissioner of Health for approval, plans for a night soil disposal plant to be located over the Snyder avenue sewer in the Thirty-ninth Ward. The night soil was to be delivered to a basin containing water; dilution was to be accomplished through mechanical mixing and then a strong solution of chlorinated lime was to be applied which would render the liquid discharged much less in bacterial content than the sewage flowing in the Snyder avenue sewer. This was to be a temporary measure only and was to be abandoned as soon as the city could close up privy vaults and substitute therefor a sewer connection. The adoption of the plan would make possible the abandonment immediately of all poudrette pits and remove the menace to public health attendant on the fertilization of crops with night soil.

The plans were approved by the Commissioner of Health and returned to the city in the form of a decree requiring that sewage should cease to be discharged into the docks along the Delaware River and that plans for an intercepting sewer, doing away with the existing nuisance caused by sewage deposits in the docks, should be prepared and submitted to the Commissioner of Health for approval.

The water analyses at Stations Nos. 2 and 3 in the Frankford District are particularly significant with respect to the total count. The following table illustrates this point:

BACTERIAL COUNTS OF WENTZ FARM RESERVOIR WATER COLLECTED AT CITY TESTING STATIONS NOS. 2 AND 3—TWENTY-THIRD WARD—FRANKFORD DISTRICT—1913.

Station No. 2.				Station No. 3.			
Date.	Count.	B. Coli.		Date.	Count.	B. Coli.	
		1 CC.	10 CC.			1 CC.	10 CC.
May 28,	30	—	—				
June 2,	7,300	—	—	June 2,	1,400	—	—
June 4,	2,500	—	—	June 4,	1,000	+	+
June 6,	1,500	—	—	June 6,	560	—	+
June 9,	140	—	—	June 9,	55	—	—
June 11,	40	—	—	June 11,	56	+	+
Aug. 18,	130	—	—	Aug. 18,	98	—	—
Aug. 20,	425	—	—	Aug. 20,	380	—	+
Aug. 22,	1,500	—	—	Aug. 22,	37	—	+
Aug. 25,	640	—	—	Aug. 25,	540	—	—
Aug. 27,	155	—	—	Aug. 27,	62	—	—

These two periods of explosive total counts followed immediately sulphate of copper treatment of the Wentz Farm reservoir water. They illustrate how quickly the reservoir water influences the water in the distributing pipes at Stations 2 and 3.

Wentz Farm reservoir has about five acres of open water surface. When the water is at the nineteen foot depth line (which is the limit of use) of the reservoir 32,000,000 gallons are stored. In October, 1911, during the repair of the force main nearby, the mud deposit was sounded, the water in the reservoir being drawn down then to the seven foot level. Fish were plentiful and the mud was found to be three feet deep in the centre of the basin and higher on the sides, which slope and are brick paved, with water reeds growing up between. This mud has never been cleaned out. Frequently the draught lowers the level six feet but, it is stated, from July, 1912, to October, 1913, approximately, the water level has not been below the twelve foot stage. In the hot days of summer, especially during Monday forenoon, the water level is lowered four feet in a few hours. The water enters and leaves the reservoir at the bottom, the water level continually fluctuating, the flow being out of the basin day-times and into it at night. This represents the movement of the water in the distributing pipes of the Frankford District also. Wentz Farm water goes to the consumers day-times and fresh Lardner's pumping station water goes to the consumers night-times. Twenty-four hour samples collected hourly at Station No. 2 show this clearly, so it is reported by the City Water Bureau.

Saturday noons the water stage in the Wentz Farm reservoir is usually about thirteen feet. Sundays, when the consumption is less in the district, the reservoir is filled to the nineteen foot stage and is ready for the Monday forenoon draught.

In the winter the reservoir surface is frozen over which eliminates the influence of wind; but the disturbances due to fluctuation are going on. In the other seasons the winds must influence the quality of the water and especially in the spring and again in the fall, when the temperatures of the upper and lower layers of water are nearly equal and an equilibrium prevails which encourages the physical turning over of the water and is denoted the "seasonal turn-over" in lakes and ponds.

The mud deposits contain B. Coli and various other bacterial organisms. It is probable that the presence of the mud and all it contains in the basin together with the rushing in and out at the bottom constantly of four-tenths of the volume of the stored water together with the other disturbances, influence and diminish the potability of the water.

The Wentz Farm reservoir storage is too little for present purposes. The mud should be cleaned out, and after thorough cleansing the basin should be covered; but before this covering is put on, a much larger covered storage basin should be built adjacent and put into commission. In this connection it may be noted that the district tributary to this reservoir comprising the Thirty-fifth, Forty-first, Twenty-third, a part of the Forty-second and most of the Thirty-third Wards, is

growing rapidly. The Holmesburg District is included within the Wentz Farm reservoir territory but at present the public water is being supplied there by a private corporation leased and operated by the Holmesburg and Bristol Water Company. No typhoid has been reported among the consumers of this water in 1913. The supply is taken from Pennypack Creek and filtered, under a permit from the Commissioner of Health. There is dissatisfaction about water rates and extensions and eventually the city will acquire the works.

Furthermore, at Wentz Farm reservoir there is a pumping station and intake connected to the force main from Lardner's Point Station, which raises the water into a stand pipe supplying the neighborhoods of McCartersville and Crescentville in the Forty-second Ward, and Fox Chase, Verreeville, and Bustleton, in the Thirty-fifth Ward. About two million gallons daily are consumed. At Byberry farms the city is erecting an institution which demands a large supply. Extensions to water lines are needed elsewhere in the district and the problem of enlarging the pumping station and stand pipe to meet the growing demands is imminent. In the Wentz Farm high service district there are several growing communities and the city will be obliged to prepare plans for these extensions and improvements. However, the cleaning out of the Wentz Farm Reservoir should be undertaken at once.

TYPHOID FEVER IN THE WENTZ FARM WATER DISTRICTS.

In the Wentz Farm reservoir high service district there have been four cases of typhoid fever during 1913 to November 1st. Two of them were imported, one belonged to the cases infected at a wedding breakfast in West Philadelphia, and the other case, onset on July 10th, has no determined origin. In this district 9,400 persons reside. So Wentz Farm water is not charged with having caused typhoid fever here.

In the Wentz Farm low service district there is a resident population of about 78,000 persons, divided approximately as follows, the typhoid cases for the year being given by the Wards:

TYPHOID FEVER CASES FOR 1913 AND THE POPULATION BY WARDS IN THE WENTZ FARM LOW SERVICE DISTRICT.

Ward.	Population.	Typhoid Cases.
Part of Thirty-fifth Ward,	2,500	1
Part of Forty-first Ward,	3,000	0
Part of Forty-second Ward,	8,800	6
Entire Twenty-third Ward,	32,100	10
Part of Thirty-third Ward,	17,000	12
Part of Forty-third Ward,	15,000	12
	78,500	41

Ten of these cases can be accounted for; two were mistakes of diagnosis, one bathed in the river at a sewer outlet, one was a secondary, and six were imported.

Of the thirty cases to be accounted for, five are in a group in a remote corner of the district in the Forty-second Ward, in the vicinity of Logan Station. The dates of onset were as follows:

February 28.
May 6th.
June 9th.
September 10th.
October 13th.

Two of these cases occurred in the first five month period of the year when the water analyses showed good water.

In the Thirty-third Ward, of ten cases to be accounted for, seven of them were in the district known as Cooperville. Their onsets were as follows:

January 2nd.
January 4th.
July 18th.
July 25th.
August 2nd.
August 4th.
September 13th.

Three casese in the Thirty-third Ward occurred at Harrowgate. Their onsets were March 15th, June 14th, and July 5th respectively. None of these cases have been reinspected.

Nine cases in the Forty-third Ward remain unaccounted for. They are grouped together in the extreme end of the district known as Franklinville. They have not been reinspected. The dates of onsets were as follows:

January 14th.	July 6th.	August 16th.
March 15th.	July 11th.	August 25th.
June 20th.	July 25th.	September 12th

Grouping these thirty-one cases and presenting them by months and neighborhood it appears, taking the district as a whole, that ten cases occurred from January to May inclusive, when the water was good as tested at Frankford, and that twenty-one cases occurred during the succeeding five months.

WENTZ FARM LOW SERVICE DISTRICT TYPHOID 1913. THIRTY-ONE CASES OF UNKNOWN ORIGIN GIVEN BY MONTHS AND NEIGHBORHOODS.

Neighborhood.	Ward.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total.
Frankord, ...	23	3	0	0	0	0	2	0	1	0	1	7
Harrowgate, ..	33	0	0	1	0	0	1	1	0	0	0	3
Cooperville, ..	33	2	0	0	0	0	0	2	2	1	0	7
Franklinville,..	43	1	0	1	0	0	1	3	2	1	0	9
Logan Station,	42	0	1	0	0	1	1	0	0	1	1	5
Total,...	.....	6	1	2	0	1	5	6	5	3	2	31

The City Bureau of Health made special tests of the water at Harrowgate, Cooperville, and Franklinville during the first part of October on three different days and found the water to be satisfactory. The State Department of Health ran a series of tests at the Cooperville Station and obtained similar results. The following tables present the data:

SPECIAL TESTS IN SOUTHERLY END OF WENTZ FARM LOW SERVICE DISTRICT—1913. MADE BY CITY WATER BUREAU.

Station.	October 2.			October 6.			October 8.		
	Bacteria.			Bacteria.			Bacteria.		
	Total.	B. Coli.		Total.	B. Coli.		Total.	B. Coli.	
		1 CC.	10CC.		1 CC.	10CC.		1 CC.	10CC.
Harrowgate District.									
Tioga and F Sts., 33d ward, ...	83	.....	.....	60	.....	.....	55	.....	.....
Cooperville District.									
Allegheny & B Sts., 33d ward, ...	13	.....	.....	25	.....	.....	25	.....	.....
Franklinville District.									
Fifth & Rising Sun Sts., 43d ward, ...	15	.....	.....	50	.....	.....	51	.....	.....
No. Penn Junction, 33d ward, ...	12	.....	.....	25	.....	.....	35	.....	+

On October 8th, 1913, the State Department of Health collected a sample at Fifth and Rising Sun streets and found it contained one B. Coli to the cubic centimeter and a total count of eighty.

STATE DEPARTMENT OF HEALTH ANALYSES OF WENTZ FARM LOW SERVICE WATER AT COOPERVILLE—ALLEGHENY AND B STREETS, THIRTY-THIRD WARD, 1913.

October.	Bacteria Per C. C.		
	Total Count.	Pink Colonies.	B. Coli.
10,	500	0	0
11,	20	0	0
12,	20	0	0
13,	50	0	0
14,	....	....	....
15,	250	2	2
16,	60	0	0
17,	125	0	0
18,	25	0	0
19,	30	0	0
20,	70	0	0
21,	60	0	0
22,	60	0	0
23,	12	0	0
24,	4	0	0
25,	23	0	0
26,	....	....	....
27,	350	0	0
28,	40	0	0
29,	32	0	0
30,	32	0	0
31,	24	0	0

Relative to typhoid the question may arise as to whether there is more typhoid or less in the Wentz Farm district this year than in former years. For ready comparison the entire wards are taken whether portions or all of them are within the Wentz Farm reservoir district. This will include of course portions of Upper and Lower Roxborough, Queen Lane, and Torresdale high and low districts, but it will serve for comparison. The wards will be 35, 41, 23, 42, and 43.

TYPHOID FEVER CASES FOR SEVERAL WARDS WHOLLY OR PARTLY IN THE HIGH AND LOW SERVICE WENTZ FARM RESERVOIR DISTRICTS.

Month.	35th Ward			41st Ward.			23d Ward.		
	1911.	1912.	1913.	1911.	1912.	1913.	1911.	1912.	1913.
January,	3	0	0	1	0	1	1	1	3
February,	0	0	0	0	0	0	0	1	1
March,	0	1	0	0	0	0	0	0	0
April,	0	1	0	1	0	0	0	0	0
May,	0	0	0	2	0	0	0	0	0
June,	0	1	1	0	0	0	0	2	2
July,	0	0	0	0	0	0	1	1	1
August,	1	1	3	1	0	1	2	2	1
September,	0	1	0	1	1	1	3	3	1
October,	1	1	0	0	4	0	2	1	1
November,	1	0	..	0	2	..	2	2	..
December,	1	0	..	0	0	..	2	1	..
Total,	7	6	4	6	7	3	20	14	10

	33d Ward.			42d Ward.			43d Ward.		
January,	1	2	2	2	17	1	1	11	1
February,	2	3	2	3	1	3	1	7	3
March,	2	1	3	1	1	0	2	1	3
April,	0	0	1	1	0	1	4	2	0
May,	2	1	2	2	0	3	4	2	0
June,	1	6	4	0	0	1	1	1	1
July,	1	0	11	0	1	1	4	3	4
August,	5	1	6	5	3	1	3	5	3
September,	7	2	5	3	1	3	5	3	5
October,	6	1	3	2	2	1	1	3	1
November,	1	2	..	1	1	..	2	1	..
December,	1	3	..	11	3	..	5	0	..
Total,	29	22	39	31	30	15	33	39	21

In the Forty-second and Forty-third Wards during December, 1911, and January and February, 1912, there was an epidemic due to the break in the water main in the Roxborough District and the introduction of raw Schuylkill River water into the system. This accounts for the increased typhoid fever in the table for these two wards during that period. Deducting those months from the totals and it will appear that the typhoid cases are fewer in 1913 than in the other years for Wards 42 and 43, but there are more for the Thirty-third Ward. In the Thirty-fifth, Forty-first, and Twenty-third Wards typhoid fever has been less this year than formerly.

If the cases in the Wentz Farm reservoir district had been thoroughly canvassed, perhaps the origin of more of the cases might have been determined. Whether the public water transmitted typhoid through street mains remains an open question.

SUMMARIZATION OF TYPHOID CASES IN FRANKFORD AND WENTZ FARM RESERVOIR WATER DISTRICTS.

These districts really form one. The settlement of Wissinoming, where the consumers always get the water fresh off the Lardner's Point force main, lies in the southern portion of the Forty-first Ward with a resident population of 3,000. There are sixteen thousand persons in the entire Forty-first Ward, which stretches northward along the river beyond Torresdale to the city limits, and the other thirteen thousand reside in the villages of Tacony and Holmesburg (supplied by the Holmesburg Water Company) and in a large rural territory.

During the year 1913, not a case of typhoid fever occurred among the three thousand residents in the Wissinoming settlement and but two cases in the rest of the Forty-first Ward, one imported and the other of unknown origin. Therefore, the city water did not bring infection to the Wissinoming settlement.

Frankford comprises the Twenty-third Ward, population 32,000. During the night the pipes in this district are furnished with fresh Lardner's Point water and daytimes the water comes from Wentz Farm reservoir, which is Lardner's Point water subjected to any influences existent in the reservoir due to mud, algous growth, and other local disturbances *plus* any dual pipe connection pollution that may have occurred.

In the Twenty-third Ward for the year 1913, there were ten cases of typhoid fever as follows:

TYPHOID FEVER CASES—TWENTY-THIRD WARD—WENTZ FARM WATER DISTRICT—LOW SERVICE—1913.

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.
Jan. 2,.....	A. B.	34	M.	Bridge, ...	Machinist, ...	Unknown.
Jan. 20,.....	A. K.	19	F.	Cambridge,	Factory, ...	Unknown.
Jan. 24,.....	J. D.	4	M.	Worth, ...	At home, ...	Unknown.
Feb. 24,.....	Mrs. P.	33	F.	Orchard, ..	Housewife, ...	Doubtful diagnosis.
June 9,.....	E. C.	25	M.	Franklin, ..	Electrical engineer, ..	Imported.
June 10,.....	I. P.	3	F.	Frankford, .	At home, ...	Unknown.
July 12,.....	A. M.	23	M.	Melrose, ...	Disston's Saw Works,	River bather.
Aug. 18,.....	A. D.	25	F.	Salem, ...	Factory, ...	Unknown.
Sept. 3,.....	A. M.	35	F.	Franklin, ..	Housewife, ...	Imported.
Oct. 6,.....	M. G.	7	F.	Orthodox, ..	School, ...	Raw vegetables.

SUMMARY OF TYPHOID FEVER IN THE TWENTY-THIRD WARD FOR 1913.

Month.	Total Cases.	Accounted For.	Unaccounted For.
January, ...	3	0	3
February, ...	1	1	0
March, ...	0	0	0
April, ...	0	0	0
May, ...	0	0	0
June, ...	2	1	1
July, ...	1	1	0
August, ...	1	0	1
September, ...	1	1	0
October, ...	1	1	0
Total, ...	10	5	5

Imported cases,	2
Not typhoid,	1
Bathing in river,	1
Raw vegetables,	1
Accounted for,	5 for 1913

There has been a steady diminution in typhoid fever for the last six years in the Twenty-third and Forty-first Wards, taking it as an entire period. It was higher in 1909 than in 1908, occurring mostly in the winter months in these two years. It was low in 1910, January being the high month. In 1911, the cases increased slightly, occurring mostly in the warmer months. The year 1913 was the lowest of all as will appear in the following table. The data for the Forty-first Ward include the entire population, not merely cases in the Wissinoming section. Of course, for the Twenty-third Ward, they represent the city water district. It may be significant that the hypochlorite of lime treatment was not applied until November, 1910, continued until May of 1911, and then discontinued until December, 1911, since when this disinfectant has been constantly applied at Torresdale. Furthermore, the preliminary filters were not put in service until February of 1909. So the water was not as safe and good in 1908, 1909, and 1910, as during 1911, and presumably the water was better during 1912 and 1913, due to the constant application of hypochlorite of lime, than before. These facts seem to emphasize the value to public health of the preliminary filters and of the additional safeguard due to the application of hypochlorite of lime.

In the following table and in many similar tables the beginning of the general filtration, (that is the time when all the water was filtered), will be indicated by "F" and the introduction of prefilters by "PF." It is to be understood that the use of these filtration methods is continuous from the time thus indicated. The use of the hypochlorite of lime as a disinfectant will be marked "Lime."

TYPHOID FEVER CASES IN THE FORTY-FIRST WARD FOR SIX YEARS.

Population 16,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	0	3	1	1 Lime.	0 Lime.	1 Lime.
February,	1	2 PF.	0	0 Lime.	0 Lime.	0 Lime.
March,	0	2	0	0 Lime.	0 Lime.	0 Lime.
April,	1	0	0	Lime.	0 Lime.	0 Lime.
May,	1 F.	3	0	2	0 Lime.	0 Lime.
June,	0	0	0	0	0 Lime.	0 Lime.
July,	0	0	0	0	0 Lime.	0 Lime.
August,	0	1	0	1	0 Lime.	1 Lime.
September,	3	1	0	1	1 Lime.	0 Lime.
October,	2	0	1	0	4 Lime.	0 Lime.
November,	0	1	1	0	2 Lime.	.....
December,	3	2	1 Lime.	0 Lime.	0 Lime.	.....
Totals,	11	15	4	6	7	2

TYPHOID FEVER CASES IN THE TWENTY-THIRD WARD FOR SIX YEARS.

Population 32,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	8	15	4	1 Lime.	1 Lime.	3 Lime.
February,	4	4 PF.	0	0 Lime.	1 Lime.	1 Lime.
March,	1	0	1	2 Lime.	0 Lime.	0 Lime.
April,	2	0	0	0 Lime.	0 Lime.	0 Lime.
May,	3 F.	0	1	0	0 Lime.	0 Lime.
June,	1	2	1	0	2 Lime.	2 Lime.
July,	1	2	0	1	1 Lime.	1 Lime.
August,	2	3	1	2	2 Lime.	1 Lime.
September,	6	1	3	8	3 Lime.	1 Lime.
October,	2	1	2	2	1 Lime.	1 Lime.
November,	2	0	0	2	2 Lime.	.....
December,	5	13	1 Lime.	2 Lime.	1 Lime.	.....
Totals,	37	41	14	20	14	10

The 32,000 population in the Twenty-third Ward, with five typhoid cases unaccounted for, and the 3,000 population for the Wissinoming section, with no typhoid, make up a total population of 35,000 persons receiving city water, with five cases unaccounted for. Three of these occurred in January, while the outbreak of typhoid in the downtown Torresdale water districts was in the summer months. This apparently exempts the Frankford District typhoid from any connection with the typhoid in those downtown districts.

In connection with the consideration of the Wentz Farm reservoir low service district typhoid, a discussion of the Wentz farm reservoir high service district typhoid is pertinent. This district as already set forth, comprises part of the Thirty-fifth and Forty-second Wards. In the former out of a total population of 10,000, about 6,000 are in the high service district and in the latter, with 24,000 population, 3,400 are in the high service district.

The population of the Thirty-fifth Ward so far as public water supply is concerned, is thus divided as follows:

THIRTY-FIFTH WARD WATER SUPPLY AND TYPHOID FEVER CASES FOR 1913.

Water Supply.	Population.	Typhoid Fever Cases.	
		No. Cases.	Origin.
Wentz Farm—High Service, ...	6,000	1	Infected Water Cress.
Wentz Farm—Low Service, ...	2,500	1	Mistaken diagnosis.
No City Water, ...	1,500	3	One imported, one secondary, one unknown.
Total, ...	10,000	5	

In view of the foregoing neither the High nor the Low Service can be charged with spreading typhoid fever in the Thirty-fifth Ward in 1913.

The monthly distribution of cases for the last six years in the Thirty-fifth Ward is given in the following table:

TYPHOID FEVER CASES IN THE THIRTY-FIFTH WARD FOR SIX YEARS.

Population 10,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January, ...	1	1	1	3	0	0
February, ...	0	3	0	0	0	0
March, ...	0	2	2	0	1	0
April, ...	0	1	0	0	1	0
May, ...	1	1	1	0	0	0
June, ...	0	0	0	0	1	0
July, ...	0	0	0	0	0	1
August, ...	5	0	0	1	1	3
September, ...	1	0	1	0	1	1
October, ...	1	2	1	1	1	0
November, ...	0	1	1	1	0	.....
December, ...	2	2	1	1	0	.....
Totals, ...	11	13	8	7	6	5

Imported cases, 2; secondary case, 1; not typhoid, 1; undetermined, 1; total, 5, in 1913.

Before discussing the typhoid for the year 1913 in the Forty-second ward, the different water districts should be defined. The Forty-second Ward is long and narrow and is bounded on the north by Montgomery County. It contains the village

of Oak Lane which is supplied by the Springfield Water Company. The entire Ward had a population of 24,000 distributed by water districts as follows:

Water Supply.	Population.	Typhoid fever cases —1913.
Wentz Farm reservoir—high service,	3,400	3
Wentz Farm reservoir—low service,	8,800	6
Roxborough—high service,	1,900	1
Roxborough—low service,	400	4
Springfield Water Co.,	9,500	1
Total,	24,000	15

There were fifteen typhoid fever cases in the entire Forty-second Ward for the year 1913, as follows:

TYPHOID FEVER CASES IN THE ENTIRE FORTY-SECOND WARD—1913.

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.	Water District.*
Jan. 8,	J. M.,	12	F.	Uber,	School,	Unknown,	L. R.
Feb. 12,	M. B.,	31	M.	N. 18th,	Machinist,	Imported,	L. R.
Feb. 17,	J. W.,	25	F.	Uber,	Nurse,	Secondary,	L. R.
Feb. 23,	L. F.,	10	M.	N. 12th,	School,	Unknown,	W. F.-L. S.
Apr. 23,	G. T.,	8	F.	N. Beechwood,	School,	Unknown,	U. R.
May 6,	M. L.,	4	F.	N. Mervine,	At home,	Unknown,	W. F.-L. S.
May 22,	V. M.,	7	F.	Clarkson,	School,	Unknown,	W. F.-H. S.
May 30,	W. M.,	34	M.	Ruscomb,	Mechanical Engineer,	Imported,	W. F.-L. S.
June 9,	C. C.,	14	M.	N. Mervine,	School,	Unknown,	W. F.-L. S.
July 6,	H. T.,	42	M.	Chelten,	Manufacturer,	Imported,	Spring.
Sept. 4,	V. W.,	33	F.	N. 20th,	Housewife,	Unknown,	L. R.
Sept. 8,	E. R.,	19	F.	N. 4th,	Stenographer,	Imported,	W. F.-H. S.
Sept. 10,	W. T.,	21	M.	N. 12th,	Clerk,	Imported,	W. F.-L. S.
Oct. 13,	W. W.,	6	M.	W. Courtland,	School,	Contact,	W. F.-L. S.

*Water Districts.

	Legend.
Wentz Farm reservoir—High Service,	W. F.-H. S.
Wentz Farm reservoir—Low Service,	W. F.-L. S.
Upper Roxborough,	U. R.
Lower Roxborough,	L. R.
Springfield Water Company,	Spring.

Therefore, it appears that in the Wentz Farm reservoir high service district for the year 1913 in the Forty-second Ward there were three cases of typhoid fever, two of which were imported and one was unknown origin. A summary of cases for the entire ward follows:

TYPHOID FEVER CASES IN THE FORTY-SECOND WARD FOR 1913.

Population 24,000.

Month.	Wentz Farm District.		Roxborough District.		Springfield water district.	Totals.
	High service.	Low service.	Upper.	Lower.		
January,	0	0	0	1 unknown.	0	1
February,	0	1 unknown.	0	2(imp; sec.)	0	3
March,	0	0	0	0	0	0
April,	0	0	1 unknown.	0	0	1
May,	1 unknown.	2 unknown; imp.	0	0	0	3
June,	0	1 unknown.	0	0	0	1
July,	0	0	0	0	1 imported.	1
August,	1 imported.	0	0	0	0	1
September,	1 imported.	1 imported.	0	1 unknown.	0	3
October,	0	1 sec'd'y (?)	0	0	0	1
Totals,	3	6	1	4	1	15

Imported cases,	6
Secondary,	1
Probably secondary,	1
Accounted for,	8
Unaccounted for,	7
	15 for 1913

There has been less typhoid fever in the Forty-second Ward in 1913 than any time during the last five years. The geographical distribution of the cases in the ward for the years prior to 1913, has not been looked up but the distribution by months is given in the following table:

TYPHOID FEVER CASES IN THE ENTIRE FORTY-SECOND WARD FOR SIX YEARS.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	5	5	2	2 Lime.	17 Lime.	1 Lime.
February,	1	7 PF.	0	3 Lime.	1 Lime.	3 Lime.
March,	0	3	1	1 Lime.	1 Lime.	0 Lime.
April,	2	1	1	1 Lime.	0 Lime.	1 Lime.
May,	0 F.	3	1	2	0 Lime.	3 Lime.
June,	2	4	3	0	0 Lime.	1 Lime.
July,	0	4	1	0	1 Lime.	1 Lime.
August,	9	0	2	5	3 Lime.	1 Lime.
September,	5	3	3	3	1 Lime.	3 Lime.
October,	3	9	7	2	2 Lime.	1 Lime.
November,	1	5	0	1	1 Lime.	.....
December,	5	6	1 Lime.	11 Lime.	3 Lime.	.....
Totals,	33	50	22	31	30	15

The outbreak in the winter of 1911-1912 was due to a break in the water main in the Roxborough Water District and the supplying of raw river water to the consumers. The high typhoid in 1908-1909 was probably due to inferior water.

A summary of the typhoid fever cases in the Wentz Farm reservoir—high service district—for the year 1913—appears below:

SUMMARY OF WENTZ FARM RESERVOIR HIGH SERVICE DISTRICT TYPHOID CASES—1913.

	Population.	Total.	Accounted for.	Unaccounted for.
Thirty-fifth Ward (part),	6,000	1	1	0
Forty-second Ward (part),	3,400	3	2	1
Total in high service,	9,400	4	3	1

Since but one case in about 10,000 persons in the high service district is unaccounted for, no one would attribute this to city water infection. This is a total of 44,400 persons up to this point receiving city water in the year 1913 among whom six cases of typhoid fever occurred, whose origin cannot be accounted for, as follows:

Wissinoming—part of 41st Ward,	3,000 population—0 cases
Frankford—entire 23rd Ward,	32,000 population—5 cases
Wentz Farm High—part 35th and 42nd Wards,	9,400 population—1 case
	44,400 population—6 cases

This is a rate of fourteen cases in a hundred thousand, which may well be considered normal and allays any suspicion of the public water supply having been the cause of the cases; but for the remainder of the Wentz Farm reservoir low service district the rates increase for the year 1913. The question arises, whether other sources than the city water may not have been the cause of the typhoid in this remaining district, since the city water is not the suspected cause of typhoid in the districts already discussed receiving the same water.

There remain to be considered the typhoid cases in those portions of the Forty-third and Thirty-third Wards lying within the Wentz Farm reservoir water district. These two wards are immediately south of the Forty-second Ward, the Thirty-third Ward extending from Frankford westerly and the Forty-third Ward lying to the west of the Thirty-third. Referring to the Forty-third Ward first, before discussing the typhoid, the different water districts should be defined. The entire ward has a population of 43,000, distributed by water districts as follows:

Water Districts.	Population.	Typhoid fever cases—1913.
Wentz Farm Reservoir—Low Service,	15,000	12
Roxborough—Low Service,	7,000	3
Oak Lane—High Service,	9,000	6
Queen Lane Intermediate,	12,000	1
Total,	43,000	22

These twenty-two cases were as follows:

TYPHOID FEVER CASES IN THE ENTIRE FORTY-THIRD WARD—1913.

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.	Water District.*
Jan. 14,	L. G.,	17	M.	Sedgley,	At home,	Unknown,	W. F.-L. S.
Feb. 1,	D. M.,	23	M.	Venango,	Bartender,	Imported from down-town district.	Q. L.
Feb. 4,	P. N.,	33	M.	N. Gratz,	Sailor,	Imported,	L. R.
Feb. 5,	E. H.,	31	F.	Cayuga,	Housewife,	Not typhoid,	L. R.
Mar. 1,	I. I.,	7	F.	N. Reese,	School,	Unknown,	O. L.
Mar. 5,	W. T.,	54	M.	N. Marshall,	Civil Engineer,	Imported,	O. L.
Mar. 15,	G. S.,	20	F.	N. Fairhill,	Clerk,	Imported from down-town district.	W. F.-L. S.
June 20,	E. S.,	22	M.	N. Marshall,	Postal Clerk,	Imported from down-town district.	W. F.-L. S.
July 6,	Mrs. A.,	24	F.	N. Delhi,	Housewife,	Unknown,	W. F.-L. S.
July 11,	L. C.,	22	M.	N. Fairhill,	Leather worker,	Unknown,	W. F.-L. S.
July 18,	C. M.,	30	M.	N. Broad,	Restaurant keeper,	Imported,	L. R.
July 25,	M. C.,	22	M.	Butler,	Laborer,	Unknown,	W. F.-L. S.
Aug. 2,	N. E.,	12	M.	W. Russell,	School,	Imported,	W. F.-L. S.
Aug. 16,	W. K.,	36	M.	N. Darian,	Stationary engine fireman,	Unknown,	W. F.-L. S.
Aug. 25,	L. P.,	19	F.	N. 9th,	At home,	Imported,	W. F.-L. S.
Sept. 12,	J. F.,	21	M.	N. Fairhill,	Pick and shovel laborer,	Imported,	W. F.-L. S.
Sept. 13,	S. R.,	29	M.	N. Fairhill,	Driver,	Secondary,	W. F.-L. S.
Sept. 14,	V. A.,	26	F.	N. Marshall,	Housewife,	Imported,	O. L.
Sept. 15,	E. T.,	6	F.	N. Warnock,	At home,	Imported,	O. L.
Sept. 30,	H. S.,	20	M.	Hunting Park,	Salesman,	Imported,	W. F.-L. S.
Oct. 17,	A. H.,	7	M.	N. Marshall,	School,	Secondary,	O. L.
Oct. 17,	H. W.,	5	F.	W. Commissioner,	School,	Unknown,	O. L.

*Water Districts. Legend.

Wentz Farm reservoir—Low Service, ... W. F.-L. S.
Queen Lane, ... Q. L.
Lower Roxborough, ... L. R.
Oak Lane, ... O. L.

None of the above cases was reinspected. Possibly a reinvestigation might have cleared up some more of the origins

There follows a summary of the 1913 cases by months for the entire ward; also a tabulation of determinations as to origin:

SUMMARY OF TYPHOID FEVER CASES BY MONTHS IN THE FORTY THIRD WARD FOR 1913.
Population 43,000.

Month.	Wentz Farm Low Service Dist.		Oak Lane Water Dist.		Queen Lane Water Dist.		Lower Rox. Water Dist.		Totals.
	Cases.	Origin.	Cases.	Origin.	Cases.	Origin.	Cases.	Origin.	
January,	1	unknown,	0		0		0		1
February,	0		0		1	imported,	2	imported, not typhoid.	3
March,	1	imported,	2	one unknown, one imported.	0		0		3
April,	0		0		0		0		0
May,	0		0		0		0		0
June,	1	imported,	0		0		0		1
July,	3	unknown,	0		0		1	imported,	4
August,	3	two imported; one unknown.	0		0		0		3
September,	3	two imported; one secondary.	2	imported,	0		0		5
October,	0		2	contact, unknown,	0		0		2
Total,	12		6		1		3		22

Entire Ward.		Wentz Farm—Low Service Dist. only.
Imported cases,	12	6
Not typhoid,	1	1
Secondary,	1	
Contact,	1	
Accounted for,	15	7
Unaccounted for,	7	5
Total, 1913,	22	12

There has been less typhoid in the Forty-third Ward during ten months this year than for a corresponding period during the last five years. The distribution by months for six years is given in the following table:

TYPHOID FEVER CASES IN THE FORTY-THIRD WARD FOR SIX YEARS.

Month.	1908	1909	1910	1911	1912	1913
January,	7	14	4	1 Lime.	11 Lime.	1 Lime.
February,	3	5 PF.	6	1 Lime.	7 Lime.	3 Lime.
March,	5	0	2	2 Lime.	1 Lime.	3 Lime.
April,	0	4	0	4 Lime.	2 Lime.	0 Lime.
May,	4 F.	2	0	4	2 Lime.	0 Lime.
June,	0	6	1	1	1 Lime.	1 Lime.
July,	2	4	2	4	3 Lime.	4 Lime.
August,	0	4	1	3	5 Lime.	3 Lime.
September,	4	4	1	5	3 Lime.	5 Lime.
October,	2	4	9	2	3 Lime.	2 Lime.
November,	3	1	1	1	1 Lime.	
December,	7	0	4 Lime.	5 Lime.	0 Lime.	
Totals,	37	48	31	33	39	22

The entire Thirty-third Ward has a population of 52,000, divided by water districts as follows:

Water Districts.	Population.	Typhoid Fever Cases—1913.
Wentz Farm Reservoir—Low Service, ...	17,000	12
Upper Kensington (Lardner's pump station direct), ..	35,000	26
Total, ...	52,000	38

The twelve cases in the Wentz Farm reservoir low service district for 1913, were as follows:

TYPHOID FEVER CASES IN THE THIRTY-THIRD WARD—WENTZ FARM LOW SERVICE WATER DISTRICT—1913.

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.	In Group at
January 2,	K. W.,	17	F.	E. Ontario,	Tailoress,	Unknown,	Cooperville.
January 4,	E. T.,	13	M.	Howard,	School,	Unknown,	Cooperville.
March 15,	W. B.,	30	M.	Graysback,	Carpenter,	Imported,	Harrowgate.
June 10,	G. W.,	23	F.	Patter,	Waitress,	Imported,	Cooperville.
June 14,	J. T.,	60	M.	Boudinot,	Weaver,	Imported,	Cooperville.
July 5,	J. O.,	5	M.	N. Keim,	At Home,	Unknown,	Harrowgate.
July 18,	M. M.,	9	F.	N. Lawrence,	At Home,	Unknown,	Cooperville.
July 25,	I. G.,	10	F.	N. Water,	At Home,	Unknown,	Cooperville.
August 2,	J. W.,	29	M.	E. Thayer,	Machinist,	Imported,	Harrowgate.
August 4,	B. C.,	11	F.	E. Willard,	At Home,	Unknown,	Harrowgate.
August 31,	M. G.,	47	M.	"D,"	None,	Imported,	Cooperville.
September 13,	M. M.,	5	F.	N. Lee,	At Home,	Unknown,	Cooperville.

The twenty-six cases in the Upper Kensington water district of the Thirty-third Ward are described elsewhere in the discussion of that district. It is to be noted in the next table that in the Wentz Farm reservoir—low service district—for the year 1913, in the Thirty-third Ward, there were twelve cases of typhoid fever, five of which are accounted for—all imported—and seven of which are of undertermined origin. Perhaps if these cases had been carefully reinspected, the sources of infection might have been discovered to be other than city water:

TYPHOID FEVER CASES IN THE ENTIRE THIRTY-THIRD WARD FOR 1913.

Population 52,000.

	Wentz Farm Low Serviee Dist.		Upper Kensington District.		
	Cases	Origin.	Cases	Origin.	Total
Jan., ...	2	Unknown, ...	0		2
Feb., ...	0	.....	2	One unknown, one imported, ...	2
March, ...	1	Imported, ...	2	Imported, ...	3
April, ...	0	.....	1	Imported, ...	1
May, ...	0	.....	2	One unknown, one sewage, ...	2
June, ...	2	Imported, ...	2	One unknown, one imported, ...	4
July, ...	3	Unknown, ...	7	Three imported, one contact, three unknown.	10
Aug., ...	3	Two imported, one unknown,	3	One imported, two unknown, ...	6
Sept., ...	1	Unknown, ...	4	Two imported, one raw vege-tables, one unknown.	5
Oct., ...	0	.....	3	One pretzel, one raw vegetables, one unknown.	3
Total, .	12		26		38

	Entire Ward.	Wentz Farm—Low Service Dist. only.
Imported cases, ...	16	5
Wading in sewage, ...	1	
Contact, ...	1	
Raw vegetables, ...	2	
Pretzels, ...	1	
Accounted for, ...	21	5
Not accounted for, ...	17	7
	38	12

There has been more typhoid in the Thirty-third Ward for the year 1913, than for the year 1911 and 1912, and within one case of the same number as occurred in the year 1910. The years 1908 and 1909 were very much higher as will appear in the following table; which gives the distribution of the cases by months.

TYPHOID FEVER CASES IN THE THIRTY-THIRD WARD FOR SIX YEARS.

Population 52,000.

Month.	1908	1909	1910	1911	1912	1913
January,	6	39	14	1 Lime.	2 Lime.	2 Lime.
February,	5	8 PF.	2	2 Lime.	3 Lime.	2 Lime.
March,	7	3	2	2 Lime.	1 Lime.	3 Lime.
April,	3	4	1	0 Lime.	0 Lime.	1 Lime.
May,	3 F.	2	6	2	1 Lime.	2 Lime.
June,	5	5	2	1	6 Lime.	4 Lime.
July,	6	2	0	1	0 Lime.	10 Lime.
August,	6	4	4	5	1 Lime.	6 Lime.
September,	6	5	3	7	2 Lime.	5 Lime.
October,	5	2	3	6	1 Lime.	3 Lime.
November,	2	5	1	1	2 Lime.	
December,	6	6	1 Lime.	1 Lime.	3 Lime.	
Totals,	60	85	39	29	22	38

A summary can now be made of the typhoid fever cases in the remaining Wentz Farm reservoir—low service—district comprising portions of the Thirty-fifth, Forty-second, Forty-third, and Thirty-third Wards, where the typhoid for the year 1913 has been at a higher rate than for the other portion of this low service water district and also for the Wentz Farm high service district. This summary follows:

SUMMARY OF TYPHOID FEVER CASES DURING 1913 FOR THAT PORTION OF THE WENTZ FARM RESERVOIR LOW SERVICE DISTRICT COMPRISING PARTS OF THE THIRTY-FIFTH, FORTY-SECOND, FORTY-THIRD, AND THIRTY-THIRD WARDS. TOTAL POPULATION 43,300.

Ward.	Population.	Cases.		
		Total.	Accounted for	Unaccounted for
Thirty-fifth Ward—part, ...	2,500	1	1	0
Forty-second Ward—part, ...	8,800	6	3	3
Forty-third Ward—part, ...	15,000	12	7	5
Thirty-third Ward—part, ...	17,000	12	5	7
Totals, ...	43,300	31	16	15

Thus there are fifteen cases unaccounted for in this portion of the district in a population of 43,000 people, a rate of thirty-five cases in 100,000, which is above the normal. This rate substantially held throughout the four wards involved. Probably a re-inspection of these cases would have explained a certain number. The fact that nine of the fifteen cases occurred during the vacation season and the hot months may be significant. There are no known dual connections in these wards, but there may have been such connections not reported to the authorities nor discovered by them.

Taking the entire population in what may be considered the Frankford District, which includes Wissinoming, the Wentz Farm high and the Wentz Farm low services, there is a total of 87,700 persons among whom, for the year 1913, from January to October inclusive, there were forty-five cases of typhoid fever, of which twenty-four have been accounted for (largely as imported cases) and twenty-one remain unaccounted for, none of these having been re-inspected except in one or two instances. This gives a rate of fifty-one cases in a 100,000 of population. The summary of cases in the entire district, as thus outlined follows:

TYPHOID FEVER CASES FOR 1913—JANUARY TO OCTOBER INCLUSIVE—FOR THE FRANKFORD WATER DISTRICT WHICH INCLUDES WISSINOMING, FRANKFORD, AND WENTZ FARM RESERVOIR—HIGH AND LOW SERVICE SUB-DISTRICTS—COMPRISING ALL OF WARD 23 AND PART OF WARDS 33, 35, 41, AND 43. POPULATION 88,000. DAILY WATER CONSUMPTION 15,000,000 GALLONS.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
1, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2, ...	*2	.....	.....	.....	.....	.....	.....	2	.....	.....
3, ...	.....	.....	.....	.....	.....	.....	.....	1	1	.....
4, ...	*1	.....	.....	.....	.....	.....	.....	*1	.....	.....
5, ...	.....	.....	.....	.....	.....	.....	*1	.....	.....	.....
6, ...	.....	.....	.....	.....	*1	.....	*1	.....	.....	1
7, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8, ...	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
9, ...	.....	.....	.....	.....	.....	1+*1	.....	.....	.....	.....
10, ...	.....	.....	.....	.....	.....	1+*1	1	.....	1	.....
11, ...	.....	.....	.....	.....	.....	.....	*1	.....	.....	.....
12, ...	.....	.....	.....	.....	.....	.....	1	.....	1	.....
13, ...	.....	.....	.....	.....	.....	.....	.....	.....	1+*1	1
14, ...	*1	.....	.....	.....	.....	1	.....	.....	.....	.....
15, ...	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
16, ...	.....	.....	.....	.....	.....	.....	.....	*1	.....	.....
17, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18, ...	.....	.....	.....	.....	.....	.....	*1	1+*1	.....	.....
19, ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20, ...	*1	.....	.....	.....	.....	1	.....	.....	.....	.....

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
21,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22,	.....	.....	.....	.....	*1	.....	.....	.....	.....	.....
23,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24,	*1	1	.....	.....	.....	.....	.....	.....	.....	.....
25,	.....	.....	.....	.....	.....	.....	*2	1	.....	.....
26,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28,	.....	*1	.....	.....	.....	.....	.....	.....	.....	.....
29,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30,	.....	.....	.....	.....	1	.....	.....	.....	1	.....
31,	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
Totals, ...	6	2	2	0	3	6	8	9	7	2

The figures starred indicate that the case was of undertermined origin. From the above chart it is seen at a glance that January, and from June to September inclusive, were the peak months in high rates both as to total cases and cases of undetermined origin. Three of the January cases occurred the first part of the month, at the optimum period after the water was turbid and contained B. Coli in the filtered water basin at Torresdale, as shown by the few samples collected.

But the great majority of the cases occurred during the summer before the filters became badly clogged and more hypochlorite of lime had to be used, which was during the last part of September particularly and the first part of October. However, the bacterial evidence is too meagre at Torresdale to be absolutely sure that B. Coli were not passing through.

Another fact of importance should be noted which is, that the Frankford and Wentz Farm district receives a small part of the Torresdale filtered water. An average of about fifttten million gallons daily goes to this district; fifty-six million gallons daily go to the Oak Lane district, and a hundred and twenty-five million gallons daily to the Torresdale Low District. Hence if the filters passed bad water to a small degree, a very little of it would naturally go to the district under consideration. Most of this small quantity of bad water would go to the Torresdale Low, less to Oak Lane, and a very little, perhaps, to Wentz Farm. Furthermore, Wissinoming uses an inconsiderable quantity of water, Wentz Farm High a little more, and Frankford and the 33rd and 43rd Wards a considerable quantity. Naturally most of the infection would be carried along by the rapid currents in the large mains and would reach the distributing pipes in the districts using most of the water. So we should expect more typhoid in Frankford and in the 33rd and 43rd Wards than at Wissinoming or the Wentz Farm High Service. So the Torresdale filtered water, which we do not hold free of suspicion, might have been slightly contaminated, due to imperfect treatment at Torresdale in 1913 and not weaken the argument that city water did not cause typhoid this year in Wissinoming and Wentz Farm High and to a small extent, if at all, in Frankford and Wentz Farm Low Service, but that it may have carried typhoid to Oak Lane and the Torresdale Low Service District.

KENSINGTON WATER DISTRICT.

The Kensington water district extends along the river from Frankford Creek to Vine Street a distance of five miles and contains 334,000 population. It is divided into three sub-districts. Upper Kensington containing 104,000 persons, Middle Kensington containing 164,000 persons, and Lower Kensington containing 66,000 persons.

In this district the conditions of distribution of the water are distinctive and they affect the quality of the water. Dual pipe connections were found, sediment in the mains is extensive and tests of this mud show it to contain abundant bacterial life and the sewage organisms. The district is sub-divided by the manner in which the water is distributed. For the year 1913, there were about four hundred cases of typhoid fever from January to October inclusive in the entire district.

There are points in the Upper, Middle, and Lower Kensington districts where fresh filtered water is delivered from the large main. The entire district is on the direct pumping system from Lardner's Point station.

In 1851 there were constructed and put in operation a pumping station on the Delaware River at the foot of Susquehanna Avenue and a sedimentation and storage reservoir on Lehigh Avenue, and all of the large Kensington and Richmond District was furnished with this water. As the Delaware River water became less desirable an intake farther up the stream was discussed. In 1877 the Frankford pumping station and the Wentz Farm reservoir were completed. Later a thirty inch main was laid connecting Wentz Farm reservoir with the Kensington reservoir at Seventh

Street and Lehigh Avenue, but the old pumping station at Susquehanna and Beach Streets, known as the "Delaware Works," was not abandoned until 1890. On the site of the Kensington reservoir is now located a City Manual Training School and the Municipal Fire Service Pumping Station for the Kensington District. A small basin still exists and is used in connection with this fire station. This basin is charged with filtered Torresdale water. Some Schuylkill River water was supplied to the Kensington reservoir from the Spring Garden pumping station. Thus it will appear that many of the water pipes in the Kensington District now under discussion have been laid down and used for fifty years. Undoubtedly sediment from the Schuylkill River as well as from the Delaware River exists in these pipes. Some of this dark Schuylkill River mud was flushed out at a hydrant in October, 1913 by agents of the Commissioner of Health, analyzed and found to contain B. Coli.

In the following table are given data concerning the extent, population, and the typhoid fever of the Kensington Water District. In the preparation of this table it was not possible to pick out the cases of 1911 and 1912 which belong to the Water District, and the figures for entire wards are given.

KENSINGTON WATER DISTRICT DATA.

	Population In Water District.	Cases of Typhoid Fever.		
		1911 Entire Ward.	1912 Entire Ward.	1913 Jan.-Oct. Water Dist.
UPPER KENSINGTON.				
45th Ward, entire,	26,000	7	25	23
25th Ward, entire,	43,000	32	45	55
33rd Ward, part of,	35,000	29	22	26
MIDDLE KENSINGTON.				
31st Ward, entire,	31,000	25	22	26
19th Ward, most of,	50,000	44	44	58
18th Ward, entire,	27,000	34	33	42
17th Ward, entire,	17,000	13	15	23
16th Ward, entire,	16,000	22	15	27
20th Ward, part of,	23,000	39	45	37
LOWER KENSINGTON.				
14th Ward, entire,	19,000	14	20	22
13th Ward, entire,	20,000	25	16	26
12th Ward, entire,	15,000	18	15	21
11th Ward, entire,	12,000	9	12	8
Totals,	334,000	311	329	394

With two months lacking there is for the year 1913 a record of more cases of typhoid fever in the Kensington water district than for either 1911 or 1912. The opposite was true for the Wentz Farm reservoir district.

UPPER KENSINGTON.

The Forty-fifth ward contains the garden truck and poudrette pit district of Richmond and to the south of it the northern edge of the built up section of Richmond. In the western part is a populous area to the south of Frankford Junction Station of the Pennsylvania Railroad. This branch is carried over the Delaware River and north of it in the Forty-fifth Ward is Bridesburg lying between Frankford and the Delaware River.

On Frankford Avenue near this passenger Station is a special water sampling station known as No. 4, of the City Water Bureau. The actual location of this station was changed so that three different places were included. The following tables shows the results of the tests here:

RESULTS OF ANALYSES OF TORRESDALE WATER—CITY SPECIAL SAMPLING STATION NO. 4.—1913.

Day.	3531 Frankford Ave.						3642 Frankford Ave.			Erie, East of Frankford Ave.					
	July.			August.			September.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.
1,	.....	.....	.....	15	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,	.....	.....	.....	110	+	+	64	−	−	.....	.....	.....	.....	.....	.....
3,	.....	.....	.....	15	−	+	38	+	+	.....	.....	.....	.....	.....	.....
4,	.....	.....	.....	17	−	−	240	−	+	.....	.....	.....	.....	.....	.....
5,	.....	.....	.....	230	+	+	44	−	−	.....	.....	.....	.....	.....	.....
6,	.....	.....	.....	55	+	+	97	−	+	.....	.....	.....	.....	.....	.....
7,	.....	.....	.....	130	−	−	.....	.....	.....	.....	.....	.....	.....	.....	.....
8,	.....	.....	.....	75	+	+	61	+	+	.....	.....	.....	.....	.....	.....
9,	.....	.....	.....	28	−	−	13	−	+	.....	.....	.....	.....	.....	.....
10,	.....	.....	.....	.....	.....	.....	64	+	+	.....	.....	.....	.....	.....	.....
11,	.....	.....	.....	29	+	+	26	−	+	.....	.....	.....	.....	.....	.....
12,	.....	.....	.....	38	−	−	15	+	+	.....	.....	.....	.....	.....	.....
13,	.....	.....	.....	60	−	−	80	+	+	.....	.....	.....	.....	.....	.....
14,	.....	.....	.....	66	−	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
15,	.....	.....	.....	34	−	−	.....	.....	.....	4	−	+	.....	.....	.....
16,	.....	.....	.....	750	−	−	.....	.....	.....	84	−	+	.....	.....	.....
17,	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	−	−	.....	.....	.....
18,	.....	.....	.....	11	−	−	.....	.....	.....	68	+	+	.....	.....	.....
19,	.....	.....	.....	110	−	+	.....	.....	.....	210	−	+	.....	.....	.....
20,	.....	.....	.....	84	−	+	.....	.....	.....	490	−	−	.....	.....	.....
21,	.....	.....	.....	54	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
22,	.....	.....	.....	42	−	+	.....	.....	.....	130	−	−	300	+	+
23,	.....	.....	.....	130	+	+	.....	.....	.....	55	+	+	.....	.....	.....
24,	76	−	+	.....	.....	.....	.....	.....	.....	91	−	+	29	−	−
25,	23	−	+	40	−	+	.....	.....	.....	180	−	+	.....	.....	.....
26,	16	−	−	21	−	+	.....	.....	.....	34	−	−	.....	.....	.....
27,	18	+	+	33	−	−	.....	.....	.....	48	−	−	34	−	−
28,	40	−	+	15	−	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
29,	31	−	−	15	+	+	.....	.....	.....	14	−	−	53	−	−
30,	21	−	−	120	−	+	.....	.....	.....	97	+	+	.....	.....	.....
31,	21	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	−	−

This is a very different water from that in the Frankford District (Wentz Farm—Low Service) above. For purposes of comparison a table follows which shows the results of analyses at Station No. 4. in Upper Kensington, and Station No. 2. in Frankford. At the Station No. 4. B. Coli in one cubic centimeter were present twenty times out of sixty-five samples, and only once in fifty samples at Station No. 2. in Frankford:

COMPARATIVE TABLE SHOWING RESULTS OF ANALYSES—TORRESDALE WATER—CITY SAMPLING STATIONS—1913.

Month.	Station No. 4 (Upper Kensington.)						Station No. 2 (Frankford.)					
	Total Count.			Times B. Coli Present.		No. of samples taken for B. Coli.	Total Count.			Times B. Coli Present.		No. of samples taken for B. Coli.
	Ave.	Max.	Min.	1 CC	10 CC		Ave.	Max.	Min.	1 CC	10 CC	
July, ...	31	76	21	2	5	8	91	220	33	0	0	12
August, ...	82	750	11	9	18	27	277	1,500	37	1	1	13
September, ...	91	470	40	8	17	25	61	220	8	0	1	12
October, ...	86	300	13	1	1	5	144	270	64	0	1	13

No such water has been found anywhere above this point in the distributing system.

The City Water Bureau was advised to establish a number of temporary testing stations throughout the 45th Ward, and forthwith picked out three places near the Frankford Junction passenger station, three in Bridesburg above the railroad, and five in the Richmond District, two being along the river, one in the centre of the farms, and two in the built up section.

The Bridesburg Stations for convenience will be called A, B. and C. Results of analyses follow:

FORTY-FIFTH WARD—BRIDESBURG SAMPLES—1913.

CITY SAMPLING STATIONS.

Date.	Station A.			Station B.			Station C.		
	Richmond & Ash Sts.			Richmond & Orthodox Sts.			Richmond & Harrison.		
	Total. Count.	B. Coll.		Total. Count.	B. Coll.		Total. Count.	B. Coli.	
		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.
October 2, ...	71	—	+	37	—	—	34	—	—
October 6, ...	130	—	—	320	—	—	320	—	—
October 8, ...	170	+	+	200	—	—	230	—	+
October 10, ...	70	—	—	75	—	—	.....	.....	.....
October 13, ...	30	—	—	130	—	+	76	—	—

These waters look very much like the samples for the same dates at Station No. 3, Tacony and Lewis Streets, Frankford. Station B. is a saloon where the water is kept running pretty constantly so that the sample should represent the water in the main. The State Department of Health ran a series of tests at this station in

October and, out of twenty samples, eleven contained B. Coli ranging from one to eight and averaging a count of four to the cubic centimeter accompanied by an average total count of 240.

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER STATION B—BRIDESBURG—FORTY-FIFTH WARD—1913. UPPER KENSINGTON DISTRICT.

October.	Bacteria per C. C.		
	Total.	Pink Colonies.	B. Coli.
10,	300	12	8
11,	600	12	8
12,	300	8	2
13,	120	0	0
14,	.....	.....	.....
15,	120	0	0
16,	120	2	2
17,	250	2	2
18,	150	8	8
19,	100	0	0
20,	150	3	1
21,	150	0	0
22,	250	2	2
23,	80	0	0
24,	60	0	0
25,	50	4	0
26,	.....	.....	.....
27,	83	0	0
28,	200	6	4
29,	120	0	0
30,	120	2	1
31,	160	6	6

These results are remarkable and show an undesirable water, for they appear to be contradictory of the results of the tests of all other Wentz Farm reservoir water. It may be possible that it is Upper Kensington water at this point, the same as the water collected at Station No. 4 which was bad; but Station B is at the end of a twelve inch pipe coming down directly into Bridesburg from the centre of Frankford. There is, however, a connection down Richmond Street to Wheatsheaf Lane to the twelve inch main from Frankford Junction. The Department collected a sample at the City Water Bureau Station G here on October 9th. The total count was eighty-five and there were two B. Coli present in a cubic centimeter.

The City's Richmond District Stations for convenience have been denominated G, H, I, J, and K. Data concerning them are given in the following table:

FORTY-FIFTH WARD—RICHMOND SAMPLES—1913.

City Sampling Stations.

October.	Station G. Richmond & Wheatsheaf Lane.			Station H. Delaware & Venango.			Station I. Richmond & Ontario.			Station J. Delaware & Allegheny.			Station K. Armingo & Allegheny.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.
3.	110	—	—	380	—	—	62	—	—	82	+	+	.....	.....	.....
6.	110	—	—	380	+	+	130	+	+	45	—	+	16	—	—
8.	290	—	+	140	+	+	84	—	+	110	—	—	280	+	+
10.	40	—	—	240	—	+	210	—	+	110	—	+	50	+	+
13.	62	—	—	65	+	+	100	—	+	75	+	+	13	—	—
15.	.....	.....	.....	56	+	+	100	—	+	82	+	+	130	—	+
17.	.....	.....	.....	110	—	—	230	+	+	150	—	+	44	+	+
20.	.....	.....	.....	84	—	+	13	—	—	25	—	+	110	+	+

Station G is in the centre of the truck garden farms but on a twelve inch main that is directly connected to the forty inch force main from Lardner's Point. The results in the table show good water but the State Department of Health's sample on October 9th showed B. Coli as previously stated.

Station H is at Shoemaker's fertilizer works to which fleshings, bones, and dead animals are brought in wagons and in scows. There is a wharf, but no water on it. City water is supplied for drinking at the works and raw river water is used for fire protection and boilers. There is an artesian well, water from which is used in the manfacturing process. The samples were taken from a dead end. Adjoining, but supplied from the ten inch city main in Tioga Street, is the 25th Ward gas works, owned by the United Gas Improvement Company. City water is supplied here for drinking and lavatory purposes. Raw river water is used for fire and manufacture. Both of these plants are reported not to have a dual connection to the city water system

Station I is at the James Martin Public School. The manufacturing plants in the vicinity are reported as not having dual pipe connections, except at Baeder, Adamson & Company's Glue Works, Richmond and Allegheny Avenue, where there was a bad dual connection. There is a well at the plant, the water of which is used for factory purposes and fire lines, and one tank for storage of fire water and there are three other tanks for storage of water used in the factory. There are three Worthington Duplex pumps having suctions to the well and four inch discharge. The city four inch connection, metered, was joined to the company's fire line. This connection had no check valve, simply a valve, kept open, so it is reported. Every month there was a fire drill at the plant and the fire pumps were run up to pressure of eighty pounds, the city pressure being between forty and fifty pounds. The company may have turned the fire pumps over every week. There was nothing to prevent the well water from going into the city mains. During the first week in September, 1913, the company severed the city pipe connection and used nothing but well water for all purposes. About 450 men are employed, with no sickness among them at the time of inspection, October 1913. The well water upon analysis showed contamination and the City Board of Health condemned it. Undoubtedly this well water intermittently was sent back through the pumps into the city main. Station J samples would be affected, also I, K, and possibly G and H, but the samples in the table were collected a month after this source of contamination had been closed and shut off.

Station J is at a coal yard at the foot of Allegheny Avenue. The city here owns a recreation pier having a landing for small river passenger boats. No water on the pier. Several blocks below, at the foot of Ann Street, in the midst of the Richmond Terminal Docks of the Reading Railway Company, is a dual connection at the Port Richmond grain elevator owned by the company. Here are two check valves and a gate valve under seal on the connection. The city conducted a series of pressure gauge tests in the summer of 1913, but discovered no evidence of leakage back into the mains from the elevator plant. The fire pumps are tested every Friday. The danger here consists in neglect in closing the gate after a fire. The Reading Company had delayed severing the dual connection and the city will compel action or cut the supply off. Pollution here would probably affect Station J and Station I samples, and possibly at Station K.

Station K is at a drug store on the edge of the built up section of Port Richmond where the direction of flow in the pipe changes. From the table of results it will appear that for the five stations in the Port Richmond District, out of a total of thirty-six samples, B. Coli were present thirteen times in one cubic centimeter and twenty-five times in ten cubic centimeters. This certainly is not satisfactory for the filtered water.

The city's Frankford Junction Station neighborhood samples for convenience are denoted Stations D, E and F respectively. Data concerning them are given in the following table:

FORTY-FIFTH WARD—FRANKFORD JUNCTION STATION NEIGHBORHOOD SAMPLES—1913.

City Sampling Stations.

October.	Station D. Trenton & Venango.			Station E. Kensington & Tioga.			Station F. Frankford Junction Station.		
	Total. Count.	B. Coli.		Total. Count.	B. Coli.		Total. Count.	B. Coli.	
		1 C. C.	10 C. C.		1 C. C.	10 C. C.		1 C. C.	10 C. C.
6,	210	—	+	22	—	—	18	—	—
8,	460	—	+	180	+	+	140	+	+
10,	320	+	+	320	—	+	.....	.....	.....
13,	140	+	+	47	—	—	.....	.....	.....
15,	64	—	+	37	—	—	.....	.....	.....
17,	230	—	+	29	—	—	.....	.....	.....
20,	51	—	—	28	—	+	.....	.....	.....

As would be expected these tests show the same kind of water as the samples at City Sampling Station No. 4 in the same neighborhood. The State Department of Health ran a series of tests at City Station F, twenty samples were collected in October, eight which showed B. Coli present in one cubic centimeter ranging as high as nine colonies. The results of these State analyses are given in the following table·

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION F—FRANKFORD JUNCTION STATION—FORTY-FIFTH WARD 1913.

October.	Bacteria per C. C.		
	Total.	Pink Colonies.	B. Coli.
10,	250	0	0
11,	500	4	2
12,	400	0	0
13,	550	6	2
14,	.....	.....	.....
15,	60	0	0
16,	250	1	0
17,	80	1	0
18,	60	1	0
19,	300	0	0
20,	250	2	2
21,	40	0	0
22,	100	0	0
23,	150	0	0
24,	450	3	0
25,	200	2	1
26,	.....	.....	.....
27,	77	2	2
28,	250	9	9
29,	350	1	1
30,	30	1	0
31,	40	3	1

Considering again the Bridesburg water, which is supposed to come from Wentz Farm reservoir, note that fourteen samples collected at city stations A, B, and C in October, showed B. Coli once in one cubic centimeter, while out of twenty samples collected by the State at Station B during October, eleven showed B. Coli in one cubic centimeter. In this neighborhood there was a dual connection at the Foerderer Glue Works, which was physically severed September 24th, 1913. No

samples were taken prior to this time in this district. At the glue works seventy men are employed and at the time of inspection there was no sickness among them. They drink the city water. The Superintendent argues that if it had been contaminated, the employees would have drunk the bad water first. Large quantities of river water are used here for manufacturing purposes and in the fire service pipes. There was a three inch city connection to the line extending from the pumps to the tank on the roof. The company maintains that the valves were tight and prevented the raw water from leaking back. Every Sunday during the day city water is used for manufacturing. Now it goes direct to the tank on the roof, but prior to September 24th 1913 it discharged into the pipes filled with raw river water. At times on week days, when the river water was very bad, city water would be used but normally on Monday forenoon, raw water from the river would be again used and consequently if leakage occurred in the valve the pollution would follow and continue as long as raw water was used, that is, usually until next Sunday. Examinations of the serial samples of the State for Station B shows that of the eleven times out of twenty samples that B. Coli were found, seven were among samples collected the last half of the week, two on Thursday, three on Friday and two on Saturday. Furthermore, for these three days there were only ten samples collected—seven showing pollution—while for the other four days of the week when ten samples were collected four showed B. Coli, one on each day. This may not be significant.

Summarizing the results of the water analyses for the 45th Ward, it will be seen from the following table that, on an average, one out of every three samples shows B. Coli present in one cubic centimeter in the Bridesburg District, the Frankford Junction neighborhood and the Port Richmond neighborhood. The total counts are also higher than the Lardner's Pumping Station water. This sudden change in the quality of the water remains to be accounted for. Unknown dual connections and sediment in the pipes are suspected.

SUMMARY OF RESULTS OF ANALYSES OF FORTY-FIFTH WARD SAMPLES COLLECTED IN 1913.

Neighborhood.	Samples.	Average Total Count.	Times B. Coli present in 1CC
Bridesburg,	34	158	12
Frankford Junction,	101	117	32
Port Richmond,	37	119	14
Totals,	172	.....	58

In the 45th Ward typhoid fever has been distributed in the three districts from January to October inclusive, for 1913, as follows:

Bridesburg,	3 cases
Frankford Junction,	8 cases
Port Richmond,	12 cases
	23 cases

These cases have not been reinspected. Until October 1913 the city medical inspectors who went into the field were careless most of the time and apparently made little effort to ascertain the origin of the case. The Bridesburg cases were as follows:

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.
April 25,	C. P.,	20	M.	Almond,	Brass worker,	Raw oysters and clams.
June 10,	J. G.,	58	M.	Pratt,	Carpet mfgr.,	Unknown.
September 26,	L. B.,	31	M.	Almond,	Laborer,	Unknown.

The Frankford Junction neighborhood cases were these:—

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.
April 17, ...	T. V., ..	19	M.	Agate, ...	Laborer, ...	Imported.
May 16, ...	E. F., ..	10	F.	Whittie, ...	School, ...	Unknown.
June 17, ...	A. S., ..	17	F.	Ruth, ...	Factory, ...	Unknown.
July 2, ...	W. M., .	44	M.	Arcadie, ...	Mill hand, ...	Traveled on river boats.
July 5, ...	W. H., .	31	M.	Emerald, ...	Laborer (25th ward gas works)	Contact with river water.
July 10, ...	H. W., .	21	M.	Venango, ...	City salesman, ..	Contact at work.
August 28, ...	T. T., ..	20	M.	Frankford, ...	Hatter (Stetsons)	Contact.
September 4, ...	P. H., ..	5	M.	Frankford, ...	At home, ...	Unknown.

The Port Richmond neighborhood cases are sub-divided, five were scattered and the other seven closely grouped. The scattered cases follow:

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.
February 1, ...	J. U., ..	38	M.	Tilton, ...	Mill hand, ...	Unknown.
February 7, ...	K. K., ..	29	F.	E. Thompson, ...	Housewife, ...	Unknown.
July 2, ...	J. L., ..	18	M.	Melvale, ...	Laborer (Cramps)	Contact with river water.
August 21, ...	F. E., ..	17	M.	Wythe, ...	Chef, ...	Imported.
September 6, ..	H. K., ..	9	M.	Almond, ...	School, ...	Unknown.

The grouped cases are these:—

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.
May 29, ...	J. C., ..	7	M.	Belgrade, ...	School, ...	Unknown.
July 5, ...	E. C., ..	24	M.	Edgemont, ...	Tailor, ...	Unknown.
July 9, ...	S. G., ..	21	F.	Almond, ...	Factory (Schlichter).	Contact.
July 10, ...	R. G., ..	25	F.	Livingston, ...	Factory (Schlichter).	Contact.
July 25, ...	F. J., ..	25	F.	Emery, ...	Factory (Schlichter).	Contact.
August 2, ...	A. R., ..	25	F.	Edgemont, ...	Factory (Schlichter).	Contact.
October 9, ...	E. M., .	32	F.	Almond, ...	Domestic, ...	Unknown.

The summary for the ward is this:—

FORTY-FIFTH WARD. TYPHOID FEVER CASES 1913.

Month.	Total.	Origin.	
		Accounted for	Undetermined.
January,	0	0	0
February,	2	0	2
March,	0	0	0
April,	2	2	0
May,	2	0	2
June,	2	0	2
July,	8	7	1
August,	3	3	0
September,	3	0	3
October,	1	0	1
Totals,	23	12	11

Considering the eleven cases of undetermined origin the conclusion can hardly be reached that all of these cases were caused by a polluted city water without more definite information than was at hand. Four of the eleven cases were thirty years of age or older. The age periods follows:

Age periods	Cases
5 to 9 years,	3
10 to 19 years,	2
20 to 29 years,	2
30 years or over,	4

The 25th Ward is the heart of Richmond and contains, all along the river front, the coal yard, wharves and freight yards known as the Richmond Terminals and Transfer of the Philadelphia and Reading Railway. The Port Richmond grain elevator of this company is at the foot of Ann Street and here there is a dual pipe connection, the only one reported in the ward along the river, with the exception of the Glue Works, Richmond Street and Allegheny Avenue.

Just off Frankford Avenue on Clearfield Street is the City Water Bureau Sampling Station No. 5, in use for the last three years. It gets water direct from the main that supplies testing station No. 4 in the 45th Ward above. The following table shows the results of the tests at Station No. 5.

RESULTS OF ANALYSES AT CITY SAMPLING STATION NO. 5—TWENTY-FIFTH WARD, RICHMOND.

Month.	1911. Total Count.			1912. Total Count.			1913. Total Count.			1913. Times B. Coli Present.		1913. No. of samples taken for B. Coli.
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	1 c c	10 c c	
January,	25	80	8	31	90	10	48	110	10	.....	.....	.....
February,	16	55	10	107	430	2	35	155	10	.....	.....	.....
March,	10	15	6	89	320	15	88	550	10	.....	.....	.....
April,	14	40	10	64	290	10	265	1,100	20	.....	.....	.....
May,	15	25	8	110	440	10	163	800	4	7	12	19
June,	36	150	12	38	165	15	175	770	10	16	23	28
July,	11	15	8	21	65	10	67	480	9	9	20	22
August,	14	28	10	21	50	10	.....	.....	.....	.....	.....	.....
September,	29	185	5	27	140	10	.....	.....	.....	.....	.....	.....
October,	24	55	10	18	55	10	94	320	8	2	6	7
November,	92	350	10	36	220	10	.....	.....	.....	.....	.....	.....
December,	28	110	8	68	140	15	.....	.....	.....	.....	.....	.....

Throughout the year 1911 the water at Station No. 5 ran remarkably even. The first few months and again during the last two months in 1912 the total counts ran higher. For the year 1913 the total counts rose in April and stayed high during May and June. Unfortunately B. Coli determinations were not made of samples from Station No. 5 before May 11, 1913, as the table shows. Typhoid fever was less in the 25th Ward in 1911 than during 1912, and less in 1912 than during 1913 up to November 1st. At the first glance this increase in cases corresponds to the increase in the total bacteria.

The water comes straight from the Lardner's Point Pumping Station to City Station No. 5 with this controlling feature, that the twelve inch pipe feeding No. 5 station is taken off the forty-eight inch Lardner's Point Pumping Station force main at Frankford Junction, and there may be a local circulation in the distributing pipe in the vicinity of Station No. 5. If not, then No. 5 water should correspond with the water at City Sampling Station No. 1. In the following table this comparison is given, the results favoring Station No. 1:

AVERAGE DAILY TOTAL COUNTS BY MONTHS OF BACTERIA IN THE WATER SAMPLES AT CITY SAMPLING STATIONS NOS. 1 AND 5.

Month.	1911.		1912.		1913.	
	Sta. No. 1.	Sta. No. 5	Sta. No. 1.	Sta. No. 5.	Sta. No. 1.	Sta. No. 5.
January,	19	25	14	31	21	48
February,	32	16	99	107	6	35
March,	10	10	61	89	15	88
April,	13	14	18	64	9	265
May,	13	15	12	110	5	163
June,	31	36	13	38	7	175
July,	15	11	13	21	15	67
August,	56	14	7	21	10	—
September,	74	29	8	27	11	0
October,	45	24	9	18	10	94
November,	97	82	13	36		
December,	16	28	14	68		

This comparison is important. It shows that for the year 1911 the same water was found at both stations. For 1912 it shows a slight increase and for 1913 a very marked increase in bacteria in the water at Station No. 5. The water has been good at the upper station. It has not been good at the lower station. Therefore, the unavoidable conclusion is that the deterioration has occurred in the pipes below Station No. 1 in other words, in the Upper Kensington District. This bears out the evidence previously discussed, but it is more striking and valuable since it comes from the records for three years.

A more marked difference in the two waters is noted in the table that follows showing the days of the months. B. Coli determinations were not made at Station No. 5 until May 11th, 1913. They have been made continuously at Station No. 1 but are not shown in the table for the first four months because B. Coli were not present in any of the samples in one cubic centimeter and only four time in ten cubic centimeters. In May, June, July and August, 1913, B. Coli were entirely absent at Station No. 1, and also in September and October, excepting four times and then in ten cubic centimeters.

COMPARISON OF BACTERIAL EXAMINATIONS OF WATER SAMPLES COLLECTED AT CITY SAMPLING STATIONS NO. 1 AND NO. 5—1913.

Day.	January.		February.		March.		April.		May.				June.			
	Total Count per C. C.								Sta. 1	Station No. 5			Sta. 1	Station No. 5		
	Stations.		Stations.		Stations.		Stations.		Total Count.	Total Count.	B. Coli.		Total Count.	Total Count.	B. Coli.	
	1	5	1	5	1	5	1	5			1 c c	10 c c			1 c c	10 c c
1,	—	—	7	—	12	—	16	—	—	—			—	81	—	+
2,	12	—	—	—	10	—	14	20	7	65			3	29	—	+
3,	8	60	5	15	11	3	12	—	—	—			—	460	—	+
4,	18	—	4	—	9	—	8	115	—	—			10	200	+	+
5,	22	—	10	15	4	5	14	—	4	100			—	—		
6,	18	30	16	—	110	—	—	—	—	—			4	140	+	+
7,	8	—	3	10	72	55	6	25	8	425			—	250	+	+
8,	20	25	5	—	41	6	5	—	—	—			—	170	+	+
9,	8	—	—	—	25	—	7	490	10	280			4	20	+	+
10,	250	15	2	35	4	60	4	—	—	—			—	35	+	+
11,	10	—	4	—	4	—	3	500	8	130	—	+	5	150	+	+
12,	15	—	—	—	7	55	2	—	2	13	—	—	—	—		
13,	16	60	2	—	3	—	—	—	—	4	—	—	6	28	—	+
14,	1	—	4	155	3	40	10	120	6	140	+	+	—	300	—	+
15,	3	35	7	—	4	—	12	—	—	90	—	+	—	155	+	+
16,	16	—	—	—	—	—	15	65	1	67	—	—	3	12	+	+
17,	3	110	5	10	4	10	14	—	—	270	—	+	—	—		
18,	10	—	3	—	7	—	82	100	—	240	—	+	—	350	+	+
19,	—	—	22	20	9	15	22	—	1	120	+	+	1	81	+	+
20,	7	15	7	—	13	—	—	—	—	800	+	+	3	210	+	+
21,	4	—	3	10	—	—	6	115	2	380	+	+	—	630	+	+
22,	6	10	1	—	28	—	5	—	—	—			—	770	+	+
23,	17	—	3	—	—	—	3	1,100	2	17	+	+	3	27	+	+
24,	12	100	4	85	28	155	4	—	—	20	—	—	—	100	+	+
25,	4	—	2	—	9	—	6	425	5	14	—	—	10	180	+	+
26,	—	—	2	10	9	—	7	—	3	11	—	—	—	—		
27,	5	60	8	—	4	550	—	—	—	21	—	+	6	43	+	+
28,	9	—	4	15	5	—	5	280	2	110	+	+	—	42	+	+
29,	31	90			12	35	—	—	—	—			—	21	+	+
30,	11	—			7	—	10	120	—	110	+	+	10	10	+	+
31,	4	15			13	40			—	63	+	+				

COMPARISON OF BACTERIAL EXAMINATIONS OF WATER SAMPLES COLLECTED AT CITY SAMPLING STATIONS NO. 1 AND NO. 5—1913—Continued.

Day.	July.			August.			September.			October.		
	Sta. 1	Station No. 5		Sta. 1	Station No. 5		Sta. 1	Station No. 5		Sta. 1	Station No. 5	
			B. Coli.			B. Coli.			B. Coli.			B. Coli.
	Total Count.	Total Count.	1 c c	10 c c	Total Count.	Total Count.	1 c c	10 c c	Total Count.	Total Count.	1 c c	10 c c	Total Count.	Total Count.	1 c c	10 c c
1.	—	34	—	—	0				—				—			
2.	60	9	—	+	—				—				—			
3.	—	25	—	+	—				4				—			
4.	—	—			—				—				—			
5.	—	40	+	+	—				6				—			
6.	—	100	+	+	0				—				13	15	—	—
7.	5	12	—	+	—				—				—			
8.	—	65	—	+	1				5				10	320	+	+
9.	10	35	—	+	—				—				—			
10.	—	36	—	+	—				6				16	210	—	+
11.	2	95	+	+	1				—				—			
12.	—	13	—	+	—				7				—			
13.	—	30	+	+	9				—				3	42	—	+
14.	21	10	—	+	—				—				—			
15.	—	85	—	+	14				2				9	29	+	+
16.	12	19	—	+	—				—				—			
17.	—	110	+	+	—				10				23	31	—	+
18.	4	20	—	+	13				—				—			
19.	—	190	+	+	—				8				—			
20.	—	96	+	+	34				—				14	8	—	+
21.	3	21	+	+	—				—				—			
22.	—	480	+	+	8				7				4			
23.	10	49	—	+	—				—				6			
24.	—	—			+				6				—			
25.	7	—			4				—				6			
26.	—	—			—				4				—			
27.	—	—			—				—				—			
28.	5	—			5				—				—			
29.	—	—			—				0				—			
30.	4	—			2				4				—			
31.	—	—			—				—				—			

Even in January or February the total counts were higher at Station No. 5 than at Station No. 1. The latter part of March a great difference occurred increasing to the maximum during the middle and latter part of April. All through May, particularly the middle part, the difference was very great, continuing all through the month of June, up to the last four days, since when the counts have not run as high. The Station was temporarily discontinued July 24th and resumed on October 6th. Usually the B. Coli in one cubic centimeter accompany the high total count, but not always; occasionally B. Coli in one cubic centimeter were present in the sample when the total count was low. Furthermore, it will be noticed that between high counts and the presence of B. Coli in one cubic centimeter there will be an intervening day of very low count and absence of the sewage organism. These phenomena are not observed as Station No. 1, Lardner's Point pump house, or the Torresdale filtered water basin. Influences are at work in the Kensington District that are not operative in the Frankford District, at least to a substantial degree. It may be well at this juncture to recall the Wentz Farm reservoir phenomenon.

Certain water bacteria inhabit but do not thrive in the water there until copper sulphate is applied to destroy algae. Accompanying this operation favorable conditions for the development of these bacteria are brought about and at once they develop enormously and characterize the water in the pipes. There are many miles of old water pipes in the Kensington District that are seeded with innumerable bacterial forms. It is only necessary for any particular form to find favorable conditions in order to grow extensively. The water is of a higher temperature during the months that the total bacterial count increased as observed at Station No. 5. As has been seen, the quality of the water of the Delaware River in summer differs from that in winter. It may be quite possible that all of the circumstances combined to encourage the development of the organisms in the pipes and that this accounts for some of the increase and the marked difference between Kensington water and Frankford water, and this may apply to a degree to the B. Coli. It is a fact that the proportion of B. Coli to the total count in the samples at Station No. 5 is greater than the proportion of B. Coli to the raw river water. It is known that the mud in the pipes contains this sewage organism. It is, therefore, a hardy form and the tests suggest that the mud may be a factor in the appearance of the B. Coli in the Kensington samples.

City Water Bureau Station No. 6 was established in the summer of 1913 at Ann and Melvale streets, near the Port Richmond grain elevator, to test quality of the water in this part of the ward near the river and especially to detect, if possible, the suspected contamination from the dual pipe connection at the elevator plant. The results of analyses at this station follows:

RESULTS OF ANALYSES AT CITY SPECIAL SAMPLING STATION NO. 6—TWENTY-FIFTH WARD—RICHMOND—1913.

Day.	July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c c	10 c c		1 c c	10 c c		1 c c	10 c c		1 c c	10 c c
1	280	+	+									
2							120	+	+	29	−	+
3							150	−	+			
4				220	+	+						
5										160	−	+
6				15	−	−						
7	150	−	+									
8							19	+	+			
9										130	+	+
10							25	+	+			
11				120	−	−						
12										28	−	−
13				110	−	+						
14												
15	160	+	+				140	+	+			
16	150	+	+							250	−	+
17							78	+	+			
18				360	−	+						
19										20	−	+
20												
21	120	−	+									
22	240	+	+									
23							67	+	+			
24	39	−	−									
25							61	−	+			
26				16	−	−						
27												
28				31	+	+						
29	27	+	+				240	+	+			
30												
31	82	+	+									

In July Station No. 6 samples showed B. Coli present six times out of nine samples in one cubic centimeter and eight times out of nine in ten cubic centimeters. This was a slightly worse water than that at Station No. 5 for the same month, as here out of twenty-two samples nine showed B. Coli in one cubic centimeter and twenty samples showed B. Coli in ten cubic centimeters. So the water at the two ends of the ward were practically the same for July.

During August and September samples were not collected at Station No. 5. At Station No. 6 for August and September they ran along about the same, with a slight improvement for August.

For October samples were again taken at Station No. 5 and on the same days they were collected at Station No. 6. On these same dates samples were also collected at four other special city stations scattered over the Twenty-fifth Ward, here designated Stations A, B, C and D, and in the following table analytical results obtained are shown and compared with the results for the same days at Stations Nos. 5 and 6. No samples were collected by the City in the Twenty-fifth Ward in October except on these days.

TWENTY-FIFTH WARD. SPECIAL CITY WATER BUREAU SAMPLE STATION RESULTS COMPARED WITH CITY STATIONS NOS. 5 AND 6—SAME WARD—1913.

October.	Station A. Tremont and Cambria.			Station B. Lehigh and Aramingo.			Station C. Lehigh and Richmond.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c c	10 c c		1 c c	10 c c		1 c c	10 c c
Thursday, 2,	100	−	+	36	+	+	120	−	+
Monday, 6,	420	−	+	350	+	+	180	−	+
Wednesday, 8,	76	+	+	55	+	+	180	−	+
Friday, 10,	53	+	+	50	+	+	19	+	+
Monday, 13,	35	+	+	74	+	+	120	−	+
Wednesday, 15,	32	+	+	220	+	+	190	−	+
Friday, 17,	45	−	+	71	−	−	14	+	+
Monday, 20,									

TWENTY-FIFTH WARD SPECIAL CITY WATER BUREAU SAMPLE STATION RESULTS COMPARED WITH CITY STATIONS NOS. 5 AND 6—SAME WARD—1913—Continued.

October.	Station D. Richmond and Indiana.			Station No. 6.			Station No. 5.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c c	10 c c		1 c c	10 c c		1 c c	10 c c
Thursday, 2,	31	−	+	29	−	+			
Monday, 6,	100	−	−	160	−	+	15	−	−
Wednesday, 8,	130	+	+	110	+	+	320	+	+
Friday, 10,	130	+	+	130	+	+	210	−	+
Monday, 13,	47	+	+	28	−	−	42	−	+
Wednesday, 15,	110	−	+	180	−	−	29	+	+
Friday, 17,	120	+	+	250	−	+	31	−	+
Monday, 20,	23	−	−	20	−	+	8	−	+

It is unfortunate that these samples were not collected every day as then there would have been a continuity of evidence.

Station A is likely to be fed with water from the Frankford Avenue twelve inch main and hence be more like Station No. 5 water. The table shows that they did correspond. At Station No. 5 the Monday samples gave low counts, likewise at Station A, excepting the 13th, when B. Coli in one cubic centimeter were present.

Stations B, C, and D would more likely show the water off the thirty inch main in Lehigh Avenue and the twenty inch main in Richmond Street, influenced by what might be happening in the locality distributing pipes of the district. Here again Monday samples were lowest in total count but not in B. Coli. The results generally correspond to the samples collected other months in the year in the ward.

Station C and Station No. 6 might represent more nearly the same water, and it is found that they did so correspond, as shown in the table. Station D which is nearest No. 6 showed the worst water. The State Department of Health checked up this Station D. The results were corroborative:

STATE DEPARTMENT OF HEALTH ANALYSES AT STATION D.

October 21st,	Total 150	Pink 0	B. Coli 0
October 22nd,	Total 80	Pink 2	B. Coli 2
October 23rd,	Total 40	Pink 1	B. Coli 1

The State Department of Health checked up Station B on October 9th. The total count in this sample was 300, with two pink colonies and one B. Coli in one cubic centimeter. The Department also checked up Station No. 6 on October 9th and found no B. Coli present, but the sample contained a total count of 1,500. On both the 8th and the 10th of October the Water Bureau results showed B. Coli present with a maximum count of 130 total bacteria.

The State Department of Health also ran a series of tests at Station C in the month of October. Seventeen samples were collected from October 10th to the end of the month, nine of these samples showing the presence of B. Coli, the actual counts for this sewage organism ranging from one to four. The results are given in the following table:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION C—TWENTY-FIFTH WARD—RICHMOND AVENUE AND LEHIGH STREET.

1913. October.	Bacteria per c. c. Total.	Pink Colonies.	B. Coli.
10,	400	1	0
11,	150	3	0
12,	400	4	1
13,	80	1	1
15,	250	3	2
16,	700	2	2
17,	700	8	4
18,	600	6	0
19,	150	1	1
20,	150	1	1
24,	100	2	1
25,	80	0	0
27,	30	0	0
28,	40	0	0
29,	36	0	0
30,	42	1	1
31,	12	0	0

Summarizing the Twenty-fifth Ward analyses, it will be noted from the following table that, on an average, one out of every two samples show B. Coli present in one cubic centimeter. In the Forty-fifth Ward the ratio was one to three.

TWENTY-FIFTH WARD SAMPLES—SUMMARY FOR 1913—MONTHS WHEN B. COLI DETERMINATIONS WERE MADE.

Stations.	No. of samples.	Average total count.	Times B. Coli present in 1 c. c.
No. 5,	74	128	34
No. 6,	34	116	16
A,	7	107	3
B,	8	144	5
C,	25	191	11
D,	10	93	6
Totals,	158	.....	75

In the Twenty-fifth Ward typhoid fever has been distributed for 1913 as appears in the table following. There was a total of fifty-five cases from January to October, inclusive, with the origin accounted for in fourteen cases, leaving forty-one undetermined cases. Taking out two groups, one in the north central part near Frankford Avenue, and the other in the southern part near Edgemont and Clearfield Streets, the remaining cases are pretty well distributed throughout the Ward, and are mostly of determined origin.

TWENTY-FIFTH WARD TYPHOID FEVER CASES—1913.

Month.	Total.	Origin.	
		Accounted for.	Undetermined.
January,	0	0	0
February,	1	1	0
March,	1	0	1
April,	4	1	3
May,	8	2	6
June,	11	3	8
July,	9	1	8
August,	11	2	9
September,	9	4	5
October,	1	0	1
Total,	55	14	41

Four cases were secondary and four were imported. Three worked at the Cramp ship-yards and could get raw water for drinking or used it about the yards, and to this cause their infection is attributed. One was a city salesman who went all about Philadelphia, another travelled on the river steam boats where raw river water was furnished and another handled soiled clothing in a laundry. This makes a total of fourteen accounted for in this manner.

In the Edgemont-Clearfield group there were seventeen cases as follows: five on Tilton Street, three on Mercer Street, two on Richmond Street, two on Salmon Street and one each on Ann, Thompson, Almond, Toronto and Edgemont Streets.

The onsets on Tilton Street, and the addresses were as follows:

No. 3136 June 20th.
No. 3136 June 23rd.
No. 3133 July 22nd.
No. 3126 Aug. 15th.
No. 3060 Aug. 27th.

The housing conditions are bad here especially in the back alleys with respect to disposal of kitchen drainage, offal, and wash water. The outbreak is considered a neighborhood one and due to insanitary conditions.

The Mercer Street cases may have been contact cases; one of them was secondary. Their onsets were:

3140 Mercer St., June 16th.
3140 Mercer St., June 28th.
3038 Mercer St., July 14th.

One of the Richmond Street cases was imported—the patient being a city salesman onset May 10th. The other was on July 12th, a young man seventeen years old, origin unknown.

One of the Salmon Street cases was secondary. The first onset was May 10th. He was a driver for a department store down town. There were quite a number of typhoid cases in the store and he may have been a contact. He was one of the primary cases in the group.

The onsets of the remaining cases were as follows:

2743 Ann St., ...May 8th.
3054 Thompson St., ...May 11th.
3042 Almont St., ...May 13th.—Imported.
2834 Toronto St., ...Aug. 9th.
2989 Edgemont St., ...Sept. 7th.

On January 6th and on April 11th, the big mains in Lehigh Avenue east and Kensington Avenue north, respectively were put in commission after having been out of service one year and three months respectively because of grade crossing work under the Philadelphia and Reading Railway and the relaying of these pipe lines. Hypochlorite of lime was applied in the thirty inch Kensington main, but not in the thirty inch Lehigh main which had lain out on the street surface for a year. The water in this pipe flowed toward the groups mentioned. Furthermore, between Lehigh Avenue and Somerset Street, in Belgrade—between April 1st and May 1st—new pipe was laid in connection with grade crossing work. This pipe was exposed to pollution from two cases of typhoid fever; one on Belgrade Street and the other on Seltzer Street, the onsets being April 26th and March 20th respectively. The housing conditions were bad—privies in the back yard and house and surface drainage going to the street gutters. When the pipe was put in commission May 1st the flow was toward the group mentioned first, and may have provided a source of infection for some of the cases.

On May 19th to 21st new pipe was laid in Auburn Street between Salmon and Thompson Streets. The surface drainage from back alleys was almost sure to have contaminated the pipes before they were put in the trench. The flow here was toward the first group.

The cases in the other group near Frankford Avenue were as follows, the determinations as to origin being unsatisfactory because of paucity of data:

Onset.	Address.	Age.	Occupation.	Origin.
April 22,	2130 E. Monmouth St.,	9	School.	
April 22,	2102 Belmore St.,	2	Home.	
June 28,	1923 E. Monmouth St.,	31	Mason.	
June 28,	2063 E. Ann St.,	25	Wife.	
July 2,	2010 E. Orleans St.,	9	School.	
Aug. 18,	1941 E. Cambria St.,	17	Factory.	
Sept. 15,	2033 E. Orleans St.,	19	Tel. operator,..	Imported.
Sept. 24,	2072 E. Stella St.,	7	Home.	
Sept. 27,	2072 E. Stella St.,	5	Home.	

None of the cases in the ward has been reinspected. The original work was very poorly done. Undoubtedly evidence could have been secured upon which to base a reliable conclusion as to the origin of some of the cases, had more care been exercised.

No suspicion is attached to the milk in the ward, nor to school contact. The fifty cases were distributed among eighteen milk dealers. When a typhoid fever case is reported by the attending physician the City Board of Health placards the premises and at once notifies the milk dealers who are not permitted to take away any bottle or container from the premises. The milk must be delivered to the house in a bottle, these bottles accumulating until the house has been disinfected and the placard removed. If the bottles are not properly cleaned before used again they might be the origin of other cases. Harbison is the great milk dealer in the Twenty-fifth Ward and has one of the most modern plants for handling milk in the city. He had eighteen cases, Scheeber had five, O'Neil had five and Lutz had three. The remaining cases got milk from many different dealers.

There were fifteen scholars having typhoid, six of them with onsets in the vacation period. One was an import, one was a Delaware River victim, and two were secondaries. Two each attended the Powers, McClelland, and Hollowell Schools. The others went each to a different school.

There is nothing very satisfactory in attempting to study these cases for origin, because of lack of sufficient data. In the neighborhoods where the sanitary conditions are bad and the back alley drainage can hardly be avoided, and the season sends the children out in the street gutters and alleys to play, and the adults to the river for bathing, boating, or sailing, and about to different parks, it would be surprising indeed if the local water supply were the only agency operating to spread the disease through dirinking it. It is believed that, especially in the cases in the groups, more careful inspection would have eliminated a number of the undetermined origins.

One conclusion can be reached at this time, namely, that if the water in the street pipes has caused any of the typhoid, the pollution must have entered either through dual connections or by means of contamination of the pipes before they were laid this season and put in commission, else the infection lies dormant in the mud.

There was a known dual connection at the Baeder-Adamson Glue Works. The drilled well supply here was analyzed and found to contain B. Coli and the City Board of Health condemned the well early in October. At that time the city water had been cut off, but no typhoid is known to have existed among the 450 employees who had this water to drink, or who would have used city water mixed with this well water, and hence this fact rather argues against the proposition that the typhoid in the Twenty-fifth Ward originated from this source.

The probable menace due to neglect of cleansing and disinfecting of the water pipes before they were laid in the trench has been referred to and there was a possible pollution, which has not been definitely traced out, at Belgrade and Seltzer Streets, and at Lehigh and Kensington Avenues.

If the city water had nothing to do with the Twenty-fifth Ward typhoid then other causes, such as milk and foodstuffs and neighborhood contact were probably the agencies, but definite conclusions with respect to this phase cannot be drawn because of insufficient data.

There remains to be considered for the Upper Kensington District the lower part of the Thirty-third Ward, where reside, in the water district, 35,000 persons. This district is fed by a thirty-six inch main in Allegheny Avenue, charged with fresh Lardner's Point water from the forty-eight inch main at Emerald Street. This main parallels the forty-eight inch main previously mentioned as being tapped at Frankford to supply the Forty-fifth and Twenty-fifth Wards and tapped by the thirty inch Lehigh and Kensington Avenue main. Therefore, the Thirty-third Ward water district gets the same kind of water that is supplied to the Twenty-fifth and Forty-fifth Wards. Below are given the data relative to water tests in this part of the Thirty-third Ward. There were only three city sampling stations here, maintained for a short time in October. The State Health Department did not check up at these stations.

Out of the seventeen samples analyzed by the city between October 16th and 20th inclusive, two only showed B. Coli present in one cubic centimeter. Both of these samples were high in total count. They occurred on Wednesday and Friday, October 8th and 10th, respectively. These results are interpreted as showing that the water supplied to the district corresponds very closely with the water at Lardner's Point. Many of the mains are old and the sediment might account for the two times the bacteria ran high and B. Coli were present:

CITY WATER BUREAU ANALYSES OF SAMPLES IN THE THIRTY-THIRD WARD OF WATER FROM LARDNER'S POINT, COLLECTED AT STATIONS A, B, C.—OCTOBER, 1913.

Date.	Station A. Cambria and Front.			Station B. Lehigh and Mascher.			Station C. Kensington and Somerset.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c c	10 c c		1 c c	10 c c		1 c c	10 c c
October 2, ...	18	—	—						
October 6, ...	45	—	—	50	—	—	40	—	+
October 8, ...	39	—	+	330	+	+	21	—	+
October 10, ...				180	+	+	24	—	+
October 13, ...				14	—	—	30	—	—
October 15, ...				31	—	+	27	—	+
October 17, ...				42	—	+	35	—	—
October 20, ...				14	—	—	56	—	—

On the north side of Allegheny Avenue in the Thirty-third Ward where Wentz Farm water is supplied, out of a total of twenty-five samples, twenty-two of which were collected by the State Health Department, one only showed B. Coli.

In the Forty-seventh Ward, where Oak Lane water is supplied, out of twenty-three samples collected in October, two only showed B. Coli present, hence the conclusion is that for October the water was comparatively good, and if this is representative, then in the other months in the year the water was as good in the Thirty-third Ward District as at Lardner's Point, and if this was so then the typhoid must be accounted for in some other way than by the city water.

It should be emphasized that this part of the Thirty-third Ward is a sub-district all by itself, so far as the distribution of the water is concerned, and would not likely be affected by any happenings in the small distributing pipes of the Forty-fifth or Twenty-fifth Wards, or any other Wards.

There were twenty-six cases of typhoid fever among the 35,000 persons in the Thirty-third Ward water district. Sixteen of these could be accounted for without making a recanvass and doubtless more origins could have been determined if more careful data had been obtained. This is a gratifying showing and clears the water of much suspicion.

TYPHOID FEVER CASES—THIRTY-THIRD WARD—UPPER KENSINGTON WATER DISTRICT, 1913.

Onset.	Case.	Age.	Sex.	Street.	Occupation.	Origin.
February 4,	R. L.	21	M.	Potter,	Mill hand,	Infected water district (downtown).
February 12,	P. H.	5	M.	Cambria & E,	At home,	Unknown.
March 14,	N. J.	12	F.	N. 5th St.,	Immigrant,	Imported.
March 26,	H. L.	22	M.	Lippincott,	Laborer (Garage),	Infected water district.
April 30,	F. H.	26	M.	D,	Mill hand,	Imported.
May 2,	M. B.	2	F.	Hartville,	At home,	Unknown.
May 2,	M. S.	12	M.	Rosehill,	School,	Waded in sewage.
June 14,	M. K.	9	F.	N. Lawrence,	School,	Unknown.
June 15,	L. J.	19	M.	W. Indiana,	Mill hand,	Imported.
July 10,	J. J.	36	M.	N. 4th,	Plumber,	Unknown.
July 10,	G. S.	35	M.	E. Clearfield,	Laborer,	Imported.
July 11,	C. R.	36	M.	Budinot,	Tailor,	Infected water district.
July 15,	H. H.	5	F.	Rosehill,	At home,	Unknown.
July 16,	J. F.	15	M.	E. Indiana,	Errand boy,	Contact at work.
July 17,	W. E.	11	M.	N. Oskney,	School,	Contact.
July 17,	A. W.	27	M.	N. American,	Moulder,	Unknown.
August 5,	M. M.	39	F.	N. Swanson,	Factory,	Imported.
August 11,	M. R.	16	F.	Kip,	Factory,	Unknown.
August 19,	H. S.	7	F.	E. Clementine,	At home,	Huckster's raw fruit and vegetables.
September 1,	R. L.	21	M.	Arbor,	Locomotive fireman,	Imported.
September 25,	A. W.	25	M.	N. Third,	Hostler,	Imported.
September 26,	S. P.	28	F.	Indiana and Leithgow,	Housewife,	Unknown.
September 27,	M. S.	18	F.	Rosehill,	Factory,	Raw celery.
October 1,	H. R.	9	F.	N. Water,	School,	Pretzel infection.
October 1,	A. A.	30	F.	N. Orianna,	Housewife,	Raw fruit and vegetables.
October 3,	A. F.	31	F.	E. Sterner,	Factory,	Infected water district.

In the next table are given the cases by months, sixteen accounted for and ten undetermined, five occurring in the vacation months, which is significant. Re-inspections might have cleared up more of the cases.

SUMMARY OF TYPHOID FEVER CASES IN THAT PART OF THE THIRTY-THIRD WARD WITHIN THE UPPER KENSINGTON WATER DISTRICT—1913.

Month.	Cases.	Accounted for.	Undetermined.
January,	0	0	0
February,	2	1	1
March,	2	2	0
April,	1	1	0
May,	2	1	1
June,	2	1	1
July,	7	4	3
August,	3	1	2
September,	4	3	1
October,	3	2	1
	26	16	10

SUMMARY OF TYPHOID FEVER CASES IN THE UPPER KENSINGTON WATER DISTRICT FOR 1913. FROM JANUARY TO OCTOBER, INCLUSIVE.

Ward.	Total cases.	Accounted for.	Undetermined.	
			Total.	Percentage.
45	23	12	11	48
25	55	14	41	75
33	26	16	10	38

In the Twenty-fifth Ward, where the percentage of undertermined origins is high, is where the polluted water has been found in the mains. This is significant and directs suspicion particularly to this ward and warrants an investigation at all of the factories and mills there to find possible dual connections. Possibly the cases of unknown origin might be reduced by re-canvassing.

SUMMARY OF WATER SAMPLE ANALYSES IN THE UPPER KENSINGTON WATER DISTRICT FROM RESULTS OF CITY AND STATE EXAMINATIONS—1913.

District.	Number samples.	Average. Total count.	Times B. Coli present.	Ratio.
45th Ward:				
Bridesburg,	34	158	12	
Frankford Junction,	101	17	32	
Port Richmond,	37	119	14	
	172	17 to 158	58	1 : 3
25th Ward,	158	93 to 191	75	1 : 2
33rd Ward,	17	57	2	1 : 8
Totals,	347		135	

On the bases of this water summary the origin of more of the typhoid fever cases should be accounted for in the Thirty-third Ward than in the other wards from causes other than the public water.

A study was undertaken of the circulation of the water in the distributing mains in which were considered the fluctuation in the daily output of the Torresdale filters and the daily pumpage at Lardner's Point to determine if there are any particularly high days which would be accompanied by high velocities in the pipe and stirring up of the mud with any consequent effect that might follow, as to the quality of the water. This involved a detailed study of the facts relative to the output of the water at the filter plants, the pumping records at Lardner's Point Station, the uses on various days of the water in the sub-districts and the relation of the above to the quality of the water as indicated by the results of analyses of samples collected throughout the sub-districts as well as at the pumping station and filter plants. Also the bearing of the known or suspected dual connections to this phase of the problem was looked into. The detailed discussion need not be set forth here but the conclusions reached are pertinent.

The conclusions relative to the contaminating influences in the Upper Kensington water district are, that the causes of contamination are less active on Sunday and possibly the first part of the week than the latter part. At least, the bacterial evidence is much more abundant in samples collected on Wednesdays, Thursdays, Fridays and Saturdays. These influences do not operate, so far as they can be detected by the evidence at hand, in the Wentz Farm reservoir district. The quality of the water is uniform at Torresdale and Lardner's Point as previously described. It becomes contaminated in the pipes in the Upper Kensington District. The contamination has been greater during the year 1913 at City Station No. 5 in the Twenty-fifth Ward than during 1912 or 1911. Furthermore, the contamination increases in May and the indications are that it drops off in November. This seasonable disturbance is probably due to activities in construction work. The changes and improvements and extensions in the distributing pipe system, the increased consumption of water and the accompanying stirring up of the mud in the pipes, would cause this seasonal increased contamination, and the daily increase progressively during the week. It is not known that at any dual connection the contamination would have occurred more on one day than on another. The flow back into the city mains would depend on water pressure which is usually higher at nights in the city mains and lower in the day time, and lower during the forenoons and especially on Mondays. This fact would tend to make Tuesday water in the pipes more contaminated and it would appear Wednesdays or later in the week rather than in the Monday samples. On Sundays during the day-time the pressure is at its height.

There are a great many roof water tanks at the various manufacturing plants, open to the atmosphere, in which city water is stored and here it may deteriorate and flow back through leaky pipes into the city pipes. The employees at such places would be the first to get this water to drink. It would not cause typhoid and we have no outbreaks of such a kind, but such water might add B. Coli to the city water.

CONCLUSIONS RELATIVE TO WATER AND TYPHOID IN THE UPPER KENSINGTON DISTRICT.

In the Forty-fifth Ward just below Frankford, the city water becomes different and undesirable for a filtered water. No such water is found in the Frankford district. One out of every three samples analyzed showed B. Coli present in one cubic centimeter during the year 1913. The sudden change in water quality is suspected of having been due to sediment in the old pipes and to dual connections that were known and severed and to unknown dual connections. Certainly there are influences at work in the pipe system that are not at work, to a substantial degree, in the Frankford district above or at Lardner's Point Station. Typhoid also increased here.

In the Twenty-fifth Ward the water is even worse. This is the territory next south. One out of every two samples collected this year showed B. Coli present in one cubic centimeter and the typhoid rates were the highest. Housing conditions are bad. Insanitary backyards and alleys abound. Typhoid appeared in neighborhood groups. Grade-crossing work was in progress and water pipe before being laid was exposed to typhoid infection from surface drainage at nearby houses. There was this menace due to lack of cleansing and disinfecting of water pipes before they were laid in the trenches that did not obtain in the Forty-fifth Ward.

In the Thirty-third Ward the city water comes in more nearly fresh from Lardner's Point pumping station. Here one out of eight samples only showed B. Coli present in one cubic centimeter so far as the examinations extended in 1913. Consequently, if the city water were the medium of spreading typhoid, there should be less typhoid in the Thirty-third Ward than in the Twenty-fifth and Forty-fifth Wards. There were twenty-six cases and we can account for sixteen of them. In the Twenty-fifth Ward, there were fifty-five cases and we can account for but fourteen. In the Forty-fifth Ward there were twenty-three cases and we can account for twelve of them. To be sure the data are meagre and the cases have not been re-inspected, but it may be significant that where the city water

analyzed worst, there we have seventy-five per cent. of the cases undetermined as to origin, and where the water was better, the percentage is forty-eight and where the water was comparatively good, the percentage drops to thirty-eight.

These three wards have been supplied with water for the last six years in substantially the same manner that they are supplied today, and the following three tables may throw some light on the transmission of typhoid by water for this period.

TYPHOID FEVER CASES IN THE FORTY-FIFTH WARD FOR SIX YEARS. POPULATION 26,000.

Month.	1908	1909	1910	1911	1912	1913
January, ...	1	5	5	0 Lime.	1 Lime.	0 Lime.
February, ...	1	2 PF.	4	0 Lime.	0 Lime.	0 Lime.
March, ...	4	0	1	0 Lime.	1 Lime.	0 Lime.
April, ...	0	1	0	1 Lime.	2 Lime.	2 Lime.
May, ...	3 F.	2	1	1	1 Lime.	2 Lime.
June, ...	1	0	2	1	3 Lime.	2 Lime.
July, ...	1	0	0	0	1 Lime.	8 Lime.
August, ...	2	0	3	3	4 Lime.	3 Lime.
September, ...	2	1	1	0	0 Lime.	3 Lime.
October, ...	0	2	1	1	6 Lime.	1 Lime.
November, ...	2	0	1	0	3 Lime.	
December, ...	6	3	2 Lime.	0 Lime.	3 Lime.	
Totals, ...	23	19	12	7	25	23

TYPHOID FEVER CASES IN THE TWENTY-FIFTH WARD FOR SIX YEARS. POPULATION 43,000.

January, ...	5	17	8	4 Lime.	3 Lime.	0 Lime.
February, ...	8	8 PF.	4	0 Lime.	4 Lime.	1 Lime.
March, ...	5	4	5	3 Lime.	7 Lime.	1 Lime.
April, ...	3	1	4	0 Lime.	3 Lime.	4 Lime.
May, ...	8 F.	4	2	1	2 Lime.	8 Lime.
June, ...	3	3	3	1	9 Lime.	11 Lime.
July, ...	2	4	3	5	2 Lime.	9 Lime.
August, ...	13	5	10	2	3 Lime.	11 Lime.
September, ...	5	5	9	6	4 Lime.	9 Lime.
October, ...	3	6	5	6	4 Lime.	1 Lime.
November, ...	2	3	2	2	3 Lime.	
December, ...	6	13	5 Lime.	2 Lime.	1 Lime.	
	53	73	60	32	45	55

The preliminary filters at Torresdale were started in February, 1909, and they have been operated ever since. The city water was improved by them but this did not make much difference in the typhoid cases in the Forty-fifth Ward. There were about as many cases of typhoid fever for the year 1909 as for the year previous and also for the year 1910. In December, 1910, hypochlorite of lime was applied to the filtered water and continued until May, 1911, when it was discontinued until December of that year. This application was accompanied by a marked reduction in typhoid in the Forty-fifth Ward for the year 1911. Typhoid in 1912 and 1913 equalled or exceeded that of any of the other years, although hypochlorite of lime was used continuously. We conclude therefore, that the sand filters, rather than the preliminary filters, have kept the typhoid down in the Forty-fifth Ward and that hypochlorite of lime has also been an agency, the value of which for the years 1912 and 1913, is obscured because of typhoid appearing in the Forty-fifth Ward from causes other than city water. This does not necessarily mean that the city water is relieved of suspicion but the other causes of typhoid were more effective for these last two years.

For the Twenty-fifth Ward, the preliminary filters apparently did not reduce typhoid because there were many more cases in the years 1909 and 1910, when prefilters were in use, than in 1908, before they were put in commission. There was a remarkable diminution in typhoid during the years 1911 in the Twenty-fifth Ward

the same as in the Forty-fifth Ward, following the application of hypochlorite of lime, but the rates increased materially for the years 1912 and 1913. The 1913 cases were summer typhoid mostly. Hypochlorite of lime was used constantly.

TYPHOID FEVER CASES IN THE THIRTY-THIRD WARD FOR SIX YEARS. POPULATION 52,000.

Month.	1908	1909	1910	1911	1912	1913
January,	6	39	14	1 Lime.	2 Lime.	2 Lime.
February,	5	8 PF.	2	2 Lime.	3 Lime.	2 Lime.
March,	7	3	2	2 Lime.	1 Lime.	3 Lime.
April,	3	4	1	0 Lime.	0 Lime.	1 Lime.
May,	3 F.	2	6	2	1 Lime.	2 Lime.
June,	5	5	2	1	6 Lime.	4 Lime.
July,	6	2	0	1	0 Lime.	10 Lime.
August,	6	4	4	5	1 Lime.	6 Lime.
September,	6	5	3	7	2 Lime.	5 Lime.
October,	5	2	3	6	1 Lime.	3 Lime.
November,	2	5	1	1	2 Lime.	
December,	6	6	1 Lime.	1 Lime.	3 Lime.	
Totals,	60	85	39	29	22	38

The Thirty-third Ward is supplied with Torresdale filtered water, 17,000 persons getting it from Wentz Farm reservoir and 35,000 persons getting it direct in the Kensington district. It will be noted that there were ninety-nine cases in the thirteen months before the preliminary filters were used and sixty-two cases in the thirteen months following the putting of these preliminary filters into commission. Hence they probably did reduce typhoid fever in the Thirty-third Ward. The biggest drop however came after hypochlorite of lime was continuously used, but the year 1913 has recorded as many cases as the year 1910, when no hypochlorite of lime was used. This indicates that the hypochlorite of lime is not a sufficient barrier to the transmission of infection in the filtered water or it points to an infection of the water in the ward or to other causes as the origin. The following is a tabulation of the typhoid cases in the Upper Kensington water district by months:

TYPHOID FEVER CASES IN THE FORTY-FIFTH, TWENTY-FIFTH AND THIRTY-THIRD WARDS, UPPER KENSINGTON WATER DISTRICT, FOR THE YEAR 1913. POPULATION 104,000..

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total.
Total cases,	0	5	3	7	12	15	24	17	16	5	104
Unaccounted for,	0	3	1	3	9	11	12	11	9	3	62

It was then a summer outbreak in this district, and it occurred during the months that the filtered water was supposed to be good. In the Lardner's Point pumping station samples B. Coli in one cubic centimeter were not found during the years 1913, except on January 2nd, August 22nd. and September 24th; but in ten cubic centimeters they were present: January 2nd, 3rd, 6th, 28th, and 29th; February 4th; April 21st; July 2nd, 11th, 16th, 19th; August 16th, 19th, 21st, 22nd; September 4th, 5th, 6th, 8th, 9th, 10th, 12th, 15th, 23rd, 24th, 25th, 29th; and October 3rd, 8th, 9th, 16th, and 28th, respectively.

Perhaps this can better be expressed in a table:

DATES ON WHICH BACTERIA AND TURBIDITY APPEARED AT TORRESDALE AND LARDNER'S POINT—SHOWING PERIODS OF POSSIBLE INEFFICIENT FILTRATION FOR 1913.

Month.	Torresdale Filtered Water Basin.			Lardner's Point.	
	B. Coli.		Turbidity.	B. Coli.	
	1 cc.	10 cc.		1 cc.	10 cc.
January,	2	2-6-9-29	1-2-4-5-6	2	2-3-6-28-29
February,	0	0	0	0	4
March,	4	24	3-4-5-6-22-23-30-31		
April,	0	0	1-2-18-19-30	0	21
May,	0	0	1	0	0
June,	0	0	0	0	0
July,	0	1-9	0	0	2-11-16-19
August,	0	21-22-23	0	22	16-19-21-22
September,	23	1-4-7-10-11-14-23	0	24	4-5-6-8-9-10-12-15-23-24-25-29
October,	5	5-9-15-20	0	0	3-8-9-16-28

So bad water may have passed the filters and Lardner's Point the first week in January and during the first week and last week in March and during the first two days of April, the middle of April and the last of April, but not during May or June if we rely upon the meagre bacterial data before us. However, May and June were the months when typhoid broke out although there were a few cases in February, March and April in the Middle Kensington District. In July when most of the typhoid occurred for any one month the city water was not turbid, did not contain B. Coli in one cubic centimeter in the samples analyzed but did in ten cubic centimeters in six samples only. In August the next highest month from the 16th to the 23rd B. Coli appeared in ten cubic centimeters at Lardner's Point and in one cubic centimeter on the 22nd, so some bad water may have passed through to the district. The worst water came the last third of September and the first third of October when the typhoid cases dropped off. So this would lead to the conclusion that any typhoid caused by imperfectly treated water was obscured by the typhoid which came from other causes.

SUMMARY OF TYPHOID FEVER CASES WHOSE ORIGIN IS ACCOUNTED FOR IN THE UPPER KENSINGTON WATER DISTRICT FOR THE YEAR 1913.

Class.	Ward 45.	Ward 25	Ward 33	Total.
Imported,	3	5	11	19
Drinking raw river water,	2	3	3	8
Contact,	5	0	0	5
Secondary,	0	4	0	4
River boat,	1	1	0	2
Raw oysters,	1	0	0	1
Laundry,	0	1	0	1
Wading in sewage,	0	0	1	1
Pretzels,	0	0	1	1
Totals,	12	14	16	42

Perhaps re-inspections might have accounted for more of the cases. The following circular was issued by Dr. Cairns, Chief Medical Inspector of the City Board of Health, to the field medical inspectors. It explains the difficulties under which the State Department of Health has labored in gathering data relative to typhoid:

"Philadelphia, Monday, October 6, 1913.

"To all Medical Inspectors:

"Mr. Vogelson has informed me that the State Department of Health, in going over the Medical Inspectors' reports on typhoid fever, has found that all the questions asked on the reports have not been fully or properly answered, and in a great number of cases no attempt has been made by the Medical Inspector to ascertain the cause of the infection—for this reason the State Department of Health has been unable to properly tabulate those cases and has offered to send the State Department Medical Inspectors in the field to go over those cases and get the required data. This Department does not care to accept this offer as it would place

us in a very embarrassing position. We already have a corps of Medical Inspectors and to accept would place us in a position of having Medical Inspectors who were either incompetent to do this work or who purposely handle the cases in a very careless manner.

"The typhoid fever situation this year is a very grave one and something scientific must be done to show the cause of the typhoid fever epidemic and to abate the same. The State investigators are unable to make a scientific investigation on account of insufficient data on your reports, and I do not doubt this data could be readily obtained if the State Department of Health places its Medical Inspectors in the field.

"You have been requested so many times to place all your energy in this work and make thorough investigation of every case with a view of fixing the cause of the infection.

"This inquiry should be made in regard to: Vacation periods; bathing or boating in any river or stream; going on picnics or river excursions.

"In cases living outside of infected districts: Has case been working or visiting in the infected district?

"The State Department has asked the following:

"Why is so much typhoid fever mostly among school children?

"On a great number of your reports on those cases you have failed to give the names and locations of the school which child attended, and this, in the cases of all school children should be carefully filled in on the blank.

"What is the typhoid fever history of associates?

"What is the typhoid fever history of school attended?

"What does a school child do differently from other members of family who do not get typhoid?

"In all cases of typhoid fever the Medical Inspector must give his conception of the infection. This is not to be given in an off-handed manner, but after complete investigation on the part of the Medical Inspector, and on which he should be able to fix the cause.

"We would regret very much to be obliged to request or accept any outside assistance in obtaining the required data, and if any Medical Inspector feels that he should receive other instructions from me as to how to handle these cases, he should make an appointment any day to see me in this office at twelve o'clock M., and I will give him as much time as is needed to instruct him.

"Medical Inspectors will be held strictly accountable for the proper investigation and the proper filling out of all data called for on the subject, irrespective of the time or place or how the same is obtained. No excuse will be accepted for failure to obtain full data.

"In all cases, irrespective of what the disease may be, the Medical Inspectors report must be completely filled up and questions intelligently answered. Information should be obtained from some reliable persons, and any information that cannot be substantiated by the Medical Inspector must be further investigated and its correctness ascertained, and in all cases it is the duty of the Medical Inspector to ascertain and give the cause of infection. On the end of the report blank the Medical Inspector must write the conception of infection, and if the report is not complete the Medical Inspector will be summoned to this office to make the needed corrections.

"A. A. CAIRNS, M. D.,
"Chief Medical Inspector."

MIDDLE KENSINGTON WATER DISTRICT.

The entire Thirty-first, Eighteenth, Seventeenth, Sixteenth Wards, most of the Nineteenth Ward, and a part of the Twentieth Ward comprise the Middle Section of the Kensington Water District.

The Thirty-first Ward has a population of 31,000. It lies south of the Twenty-fifth Ward but does not extend to the river, the river frontage being in the Eighteenth Ward. The north boundary is Lehigh Avenue, in which is laid a thirty inch main, an old pipe receiving water from the old thirty inch main up Kensington Avenue, that is charged by the new forty-eight inch steel pipe from Lardner's Point. Near the southern boundary of the ward in Susquehanna Avenue is an old thirty inch main which is fed by the Lehigh Avenue main through a cross connection, thirty-six inches in diameter, in Third Street, in the Nineteenth Ward. The old twelve inch main in Frankford Road, which passes southerly through the heart of the Thirty-first Ward, is also fed off the Lehigh Avenue main, and there are sub-mains running north and south between Lehigh and Susquehanna Avenues, in the Thirty-first Ward on Amber, Tulip, and Gaul Streets, so that the water furnished to this ward comes primarily from the forty-eight inch steel main of the Lardner's Point pumping station and passes through the old thirty inch Kensington Avenue main, and the other old mains before it reaches the consumers. Many of the distributing pipes have been down since the days of the Kensington Avenue reservoir and Delaware pumping works at the foot of Susquehanna Avenue.

In the centre of Kensington on the ward line between the Thirty-first and the Nineteenth Wards, at the corner of Front Street and Kensington Avenue, is sample station No. 8 of the City Water Bureau which has been operated for the last three years. In the following table is given a brief and comparative statement of the results:

RESULTS OF ANALYSES AT CITY STATION NO. 8—FRONT STREET AND KENSINGTON AVENUE.

Month.	1911.						1912.						1913.					
	Total Count.			Times B. Coli Present.		Number of samples taken for B. Coli.	Total Count.			Times B. Coli Present.		Number of samples taken for B. Coli.	Total Count.			Times B. Coli Present.		Number of samples taken for B. Coli.
	Average.	Maximum.	Minimum.	1 c. c.	10 c. c.		Average.	Maximum.	Minimum.	1 c. c.	10 c. c.		Average.	Maximum.	Minimum.	1 c. c.	10 c. c.	
January,	30	65	10	1	2	8	34	130	10	0	0	9	44	165	7	0	4	8
February,	16	60	8	0	1	6	89	425	10	0	1	7	38	200	2	0	1	8
March,	11	25	6	0	0	9	132	400	25	0	0	8	90	500	8	2	2	9
April,	13	22	8	0	0	8	41	125	10	1	3	9	278	980	12	0	6	9
May,	17	27	10	0	1	10	63	225	15	1	5	9	167	840	4	9	16	14
June,	47	185	20	0	4	8	45	310	12	1	3	8	176	840	10	12	22	30
July,	15	27	10	1	2	9	26	100	10	4	5	10	60	200	13	11	17	30
August,	28	130	10	3	7	9	22	50	10	0	4	7	93	380	4	12	20	27
September,	27	150	4	2	4	7	34	220	10	1	6	8	81	620	12	6	21	25
October,	28	55	10	2	4	9	18	55	10	1	6	9	76	340	19	0	8	12
November,	97	310	10	2	5	9	28	120	10	0	2	8	.....	.....	.....	.....	.....	.....
December,	26	115	10	1	2	7	54	150	15	1	3	8	.....	.....	.....	.....	.....	.....

It will be observed that the water was about the same for the years 1911 and 1912. B. Coli in one cubic centimeter were present twelve times out of ninety-nine samples in 1911 and ten times out of one hundred samples in 1912. The average total counts were slightly higher for 1912. The maxima were a good deal higher. This station is not off a large main but represents the water in the small distributing pipes.

There was a marked increase in total count beginning in March of 1913, keeping up throughout the rest of the season. In May B. Coli began to appear very frequently, increasing in June, continuing through July and August, and disappearing entirely in October. Something unusual happened from May to August inclusive.

Beginning May 11th, 1913, at Station No. 8, the samples were taken seven days out of the week up to October, although in this time some Sundays were missed Prior to May 11th and after October 1st the samples were collected on Mondays, Wednesdays and Saturdays. B. Coli determinations were started in 1911 and have been kept up ever since.

In the following table, in order to study more carefully what happened at this station during 1913, for the purpose of finding the cause of the disturbance, are given the total counts up to the time that the samples were collected daily. B. Coli determinations are omitted for the first four months of the year, because they were present in one cubic centimeter only on five days, up to May 1st.

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY STATION NO. 8, DURING 1913.

Day.	Total Count per c. c.				May.			June.			July.			August.			September.			October.		
	January.	February.	March.	April.	Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
						1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1.	.....	.....	.....	.....	.....	.....	.....	130	+	+	14	—	—	29	—	—	.....	.....	.....	.....	.....	.....
2.	.....	.....	.....	22	140	.....	.....	34	—	—	39	+	—	120	—	+	91	.....	+	.....	.....	.....
3.	35	15	35	.....	.....	.....	.....	200	—	—	41	—	—	94	+	+	180	+	+	.....	.....	.....
4.	.....	.....	.....	65	85	.....	.....	600	—	—	.....	.....	.....	30	—	—	96	—	—	.....	.....	.....
5.	.....	18	12	.....	.....	.....	.....	350	—	+	56	+	+	160	+	+	71	—	—	.....	.....	.....
6.	30	.....	.....	.....	840	+	+	200	+	+	160	+	+	79	+	+	47	—	+	54	—	—
7.	.....	17	10	75	420	+	+	260	+	+	20	+	+	70	+	+	.....	.....	.....	.....	.....	.....
8.	16	.....	.....	.....	.....	.....	.....	140	+	+	150	+	+	330	+	+	16	—	+	220	—	+
9.	.....	.....	.....	660	260	.....	.....	55	+	+	60	+	+	15	+	+	12	—	+	.....	.....	.....
10.	18	32	52	.....	.....	.....	.....	95	+	+	38	+	+	.....	.....	.....	17	—	+	60	—	+
11.	.....	.....	.....	425	13	—	—	110	+	+	63	+	+	4	—	—	26	.....	.....	.....	.....	.....
12.	.....	.....	72	.....	62	—	—	36	+	+	18	+	+	35	—	—	33	.....	.....	.....	.....	.....
13.	20	.....	.....	.....	4	—	—	14	—	—	48	+	+	54	+	+	84	+	+	21	—	+
14.	.....	200	70	65	77	—	+	140	—	+	40	+	+	38	—	+	.....	.....	.....	.....	.....	.....
15.	31	.....	.....	.....	32	—	+	400	+	+	56	+	+	130	—	+	12	—	+	40	—	+
16.	.....	.....	.....	65	54	—	+	33	—	+	42	+	+	380	—	+	42	—	+	.....	.....	.....
17.	63	2	10	350	350	+	+	85	—	+	45	+	+	.....	.....	.....	36	—	+	37	—	+
18.	.....	.....	.....	185	210	—	+	210	+	+	43	+	+	18	—	+	98	—	+	.....	.....	.....
19.	.....	7	8	.....	180	—	+	68	—	+	200	+	+	200	+	+	620	—	+	.....	.....	.....
20.	8	.....	.....	.....	700	+	+	84	—	+	110	+	+	100	+	+	160	—	+	30	—	—
21.	.....	10	.....	110	380	+	+	840	+	+	16	+	+	180	+	+	.....	.....	.....	.....	.....	.....
22.	7	.....	.....	.....	7	—	—	600	+	+	260	+	+	140	+	+	38	—	+	340	—	+
23.	.....	.....	.....	980	64	—	—	41	+	+	65	+	+	160	+	+	42	—	+	.....	.....	.....
24.	165	110	250	.....	9	—	—	230	—	—	132	+	+	.....	.....	.....	42	—	+	31	—	+
25.	.....	.....	.....	400	15	—	—	140	+	+	127	+	+	17	—	—	42	—	+	.....	.....	.....
26.	.....	.....	.....	.....	30	—	—	84	—	—	13	—	+	10	—	—	42	—	+	25	—	—
27.	.....	3	500	.....	20	—	—	51	—	—	32	—	+	39	—	+	.....	.....	.....	.....	.....	.....
28.	90	.....	.....	.....	240	—	+	21	—	—	32	+	+	27	—	+	.....	.....	.....	35	—	+
29.	.....	10	35	270	42	—	+	42	—	—	96	+	+	16	—	+	42	—	+	35	—	+
30.	66	.....	.....	.....	110	+	+	10	+	+	15	+	+	24	+	+	84	—	+	.....	.....	.....
31.	.....	.....	.....	360	72	+	+	32	.....	.....	32	—	+	.....	.....	.....	.....	.....	.....	19	—	—
	50	.....	30	.....																		

Something happened the first week in May, followed by a week of good water. In the third week, the total count and B. Coli rose again followed by a week of good water. The last few days the counts went up and the B. Coli appeared. The first few days in June, the total bacteria were high, but they were not accompanied with B. Coli. Then there was nearly a week when B. Coli were present and the rest of the month there were low counts and no B. Coli, interspersed with batches of bad water, containing B. Coli and high total counts. This is what happened during July, August, and September.

Whatever the pollution, it had passed out of the water before October, no B. Coli being present, although the total count ran up high on two days.

During 1911, with samples collected on Mondays, Wednesdays and Fridays only, Fridays were highest in total counts eighteen times, Monday sixteen times and Wednesday eleven times. B. Coli determinations were made on Mondays and Wednesdays, but none on Fridays, B. Coli appearing nine times on Mondays and three times on Wednesdays.

During 1912 at this Station No. 8, the seasonal disturbances in the water district began to manifest themselves. The total counts were highest on nineteen Wednesdays and nineteen Fridays, and on six Mondays, these Wednesdays and Fridays occurring mostly from May to August inclusive. Furthermore, the B. Coli appeared only during April, May, June, and July on Wednesdays, Fridays not being determined.

At Station No. 8 for 1913 B. Coli determinations were made from January to May 11th, and during this period Wednesdays were highest in total count seven times, Fridays six times and Mondays five times. The B. Coli in one cubic centimeter were present two times on Wednesdays and two times on Mondays, and once on Friday. Up to this time from the beginning of 1911 it is probable that the poorer water at Station No. 8 occurred during the latter half of the week, although Mondays were not low judging from the meagre B. Coli date.

But beginning May 11th, 1913, samples were collected seven days in the week, with a few Sundays excepted, up to October (twenty weeks). This was a real test and during this period the great seasonal disturbances were manifest. Saturdays were the high days in total counts and in B. Coli. On eight times Saturday was high, Wednesday four times, Tuesday three times, Sunday three times, Friday two times, and Monday and Thursday no time. B. Coli in one cubic centimeter, were present eleven times on Saturday, ten times on Wednesday, nine times on Sunday, eight times on Tuesday, five times on Friday and four times on Thursday, and but once on Monday. The significant thing is that Monday, throughout this test of twenty weeks, comprising the period of greatest disturbance in the mains, was uniformly low and the lowest of all seven days in the week for total count or B. Coli. It should be remembered that the samples were collected early Monday forenoon. These samples reflected more the Sunday water in the pipes than otherwise, it is believed, and the results are interpreted to mean that the contaminating influences were less active or ceased on Sunday and began anew and increased as the week progressed.

In the centre of the Thirty-first Ward, at the corner of Cumberland and Sepviva Streets, there is a sampling station No. 11, which has been maintained for three years by the city. No B. Coli determinations were made here for 1911 or 1912, nor in 1913 up to May 11th. From May 11th to October 1st the samples were collected seven days in the week, with a few Sundays excepted. For October the samples were again collected on Mondays, Wednesdays and Fridays the same as they had been prior to May 11th, but with this exception, that B. Coli determinations were made. In the following table is given a brief summation of the results:

RESULTS OF ANALYSES AT CITY STATION NO. 11, CUMBERLAND AND SEPVIVA STREETS.

Month.	1911.			1912.			1913.					
	Total Count.			Total Count.			Total Count.			Times B. Coli Present.		No. of Samples Taken for B. Coli.
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	1 c. c.	10 c. c.	
January,	24	55	6	32	100	5	36	95	5	.....	.....	.....
February,	18	52	10	85	390	5	33	165	5	.....	.....	.....
March,	10	20	5	124	515	16	59	320	5	.....	.....	.....
April,	15	20	12	38	135	12	212	880	15	.....	.....	.....
May,	22	105	7	66	305	15	127	1,100	2	2	12	27
June,	49	220	18	63	250	12	148	700	15	12	23	30
July,	14	200	10	36	115	10	58	320	11	8	22	30
August,	23	65	8	22	58	8	90	420	6	13	23	30
September,	31	180	11	35	150	10	81	310	5	10	18	30
October,	20	40	10	21	85	10	68	230	16	2	11	13
November,	87	360	7	30	140	8	.....	.....	.....	.....	.....	.....
December,	53	130	8	73	275	20	.....	.....	.....	.....	.....	.....

This last table shows a water month by month, year by year, remarkably the same in quality, so far as total counts are concerned, as that analyzed at Station No. 8. Coming down to the daily observations at these two stations for the year 1913, the following table is prepared for close comparison. If the two correspond week by week and day by day, then it will show confirmatory evidence that the influence which locally characterized the water embraced a large area.

ANALYSES OF WATER SAMPLES COLLECTED AT STATION NO. 11 DURING 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.			June.			July.			August.			September.			October.		
	Total Count per c c.				Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
						1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1,	.....	.....	.....	.....	.....	.....	.....	120	+	+	31	—	+	26	—	+	.....	.....	.....	110	—	—
2,	.....	.....	.....	15	15	.....	.....	140	—	+	13	—	+	186	+	+	130	+	+	.....	.....	.....
3,	55	10	13	.....	.....	.....	.....	210	+	+	40	+	+	37	+	+	220	+	+	.....	.....	.....
4,	.....	.....	.....	85	.....	.....	.....	170	+	+	.....	.....	.....	55	+	+	120	+	+	.....	.....	.....
5,	.....	10	5	.....	35	.....	.....	150	+	+	27	—	+	140	+	+	110	+	+	.....	.....	.....
6,	38	.....	.....	.....	.....	.....	.....	350	—	+	90	+	+	62	+	+	39	+	+	50	+	+
7,	.....	10	9	75	350	.....	.....	240	+	+	15	—	+	120	+	+	.....	.....	.....	.....	.....	.....
8,	30	.....	.....	.....	.....	.....	.....	130	+	+	250	+	+	240	+	+	16	—	—	140	—	+
9,	.....	.....	.....	465	300	.....	.....	32	—	+	44	—	+	23	+	+	17	—	—	.....	.....	.....
10,	5	25	32	.....	.....	.....	.....	62	—	—	24	—	+	.....	.....	.....	35	—	—	120	—	+
11,	.....	.....	.....	380	11	—	—	120	+	+	45	—	+	6	—	—	28	—	+	.....	.....	.....
12,	.....	.....	58	.....	14	—	—	35	—	+	11	—	—	11	—	+	33	—	+	.....	.....	.....
13,	40	.....	.....	.....	5	—	—	13	—	—	25	+	+	44	—	+	200	+	+	26	—	+
14,	.....	165	30	65	41	—	+	170	—	+	22	—	—	62	—	+	.....	.....	.....	.....	.....	.....
15,	12	.....	.....	.....	80	—	+	110	+	+	53	—	—	52	+	+	5	—	+	52	—	+
16,	.....	.....	.....	65	27	—	+	24	—	—	30	—	—	420	—	—	64	—	+	.....	.....	.....
17,	50	5	7	.....	140	—	+	38	—	+	39	—	+	.....	.....	.....	35	—	+	31	—	—
18,	.....	.....	7	160	350	—	+	266	+	+	40	—	+	23	—	—	150	+	+	.....	.....	.....
19,	.....	20	.....	.....	83	—	+	110	—	+	150	+	+	210	—	+	310	—	+	.....	.....	.....
20,	12	.....	.....	.....	1,100	—	+	300	—	+	100	+	+	79	—	+	37	—	—	16	—	+
21,	.....	5	.....	55	280	—	+	530	+	+	22	—	—	220	+	+	.....	.....	.....	.....	.....	.....
22,	10	.....	.....	.....	8	—	—	700	+	+	320	+	+	110	+	+	40	—	—	230	—	+
23,	.....	.....	.....	880	20	—	—	140	+	+	78	+	+	150	+	+	19	—	—	.....	.....	.....
24,	65	90	165	.....	12	—	—	70	—	—	84	—	—	.....	.....	.....	58	+	+	35	—	+
25,	.....	.....	.....	350	5	—	—	130	—	+	32	—	—	15	—	—	32	+	+	.....	.....	.....
26,	.....	10	320	.....	7	—	—	62	+	+	15	—	+	18	—	+	29	—	—	.....	.....	.....
27,	95	.....	.....	.....	2	—	—	39	—	—	39	—	+	18	—	—	63	+	+	27	+	+
28,	.....	8	35	130	130	—	+	29	—	—	19	—	+	20	—	+	.....	.....	.....	.....	.....	.....
29,	45	.. ...	.....	.....	11	+	+	26	—	+	13	—	+	17	—	+	30	—	—	32	—	+
30,	.....	.....	.....	30	57	—	+	15	—	—	29	—	+	76	+	+	200	—	+	.....	.....	.....
31,	12	.....	32	.....	47	+	+	.....	.....	.....	28	—	+	.....	.....	.....	.....	.....	.....	19	—	+

A comparison of the analyses of the waters collected day by day at Station No. 8 and Station No. 11 shows an almost exact similarity. On days when the counts were high and the B. Coli were present in one, they were high and present in the other, with few exceptions, and the remarkable thing is that the total counts of water bacteria correspond in numbers very closely. They were the same for water collected at Stations over half a mile apart in separate districts. The zone of which this must have been the centre, was a large one.

Dual connections along the river could not have caused the disturbance because the water in the pipes does not flow back from the river for a mile or more inland.

From Stations No. 8 and No. 11 data it is to be noted that the weekly, monthly, and seasonal fluctuations in water quality are the same throughout the Thirty-first Ward. Mondays have the purest water. The pollutions are present Wednesday, increasing as the week progresses. The water as it enters the ward from the forty-eight inch Lardner's Point express mains (so they may be called) is good. The water was good for the year 1911, not as good for 1912, and it started to become really bad in March, 1913, became worse in May, and continued bad until October. Something happened during the open season of 1913 that did not happen at all in 1911, and but slightly perhaps in 1912. After studying the operations of valves and the changing of currents over large zones in the Thirty-first Ward, it has been concluded that the accompanying disturbances were sufficient to produce the results in part as shown by the bacterial examinations of the waters at Stations No. 8 and No. 11 for 1912 and 1913.

All through the year 1911, when the water was good, the conditions were normal in the Thirty-first Ward. During 1912 and 1913 the conditions were abnormal due to the abolition of grade crossings at streets and the Philadelphia and Reading Railway, accompanied by the shutting off of long lengths of large controlling pipe lines, the lowering of them and the sending of water in reverse currents around through many small distributing pipes. On Lehigh Avenue, at Frankford Road intersection, there is an old thirty inch cast iron pipe main feeding the twelve inch to the north and the ten inch to the south in Frankford Road. On January 11th, 1912, in four directions from the centre section considerable pipe was closed off and emptied and the work of lowering it carried on and completed, and the Frankford Road lines and Lehigh Avenue main to the east were put in commission again June 23rd, 1912. This operation should have affected Stations No. 5 and No. 11, but No. 11 less. The putting of the pipes in commission would continue the stirred up condition for a time. It will be observed that both Stations No. 5 and No. 11, the first seven months of the year, 1912, were very much higher in bacterial counts than they were the year previous, but that for the remaining five months they corresponded to the last five months of 1911.

The next move in the grade crossing work was the cutting out of service (December 12, 1912) of the old thirty-six inch cast iron main in Lehigh Avenue, west from Kensington Avenue for a quarter of a mile or more; but this would not be likely to disturb the currents very much since it was fed near both ends by the forty-eight inch express main, so far as Station No. 8 is concerned, and it apparently did not. However, this cutting off created a dead end which has been maintained up to the fall of 1913, the influence of which would be undetermined. Furthermore, the currents in the old thirty inch main down Kensington Avenue, which connected with the old thirty inch main in Lehigh Avenue and the new forty-eight inch main would be affected some (just how much could be ascertained only by pitometer observations) and this influence would show perhaps at Station No. 5 which it did most pronouncedly the latter half of December, 1912.

The next and greatest change of all occurred on January 6th, 1913, when a long length of old thirty inch cast iron main which had been relaid in Lehigh Avenue from Kensington Avenue westerly, was put in commission. This line had been put out of use for a year (January 11th, 1912, to January 6th, 1913). The pipe lay on the surface of the ground in the street all this time. It was undoubtedly polluted and dirty and it was not cleaned or disinfected before being laid in the trench and used. The main was fed from the new forty-eight inch main at Kensington Avenue. For a year prior to January 6th, 1913, the water was supplied from the north and the south to the district on either side of Lehigh Avenue east. Now, beginning in January, 1913, the currents are suddenly reversed and the water comes into the district affecting Stations Nos. 5, 8, and 11 through this old relaid polluted pipe, and in consequence the quality of the water at Station No. 5 improved for the reason that the velocities became less and the disturbances subsided. In any case not as much water passed that way in the pipe at Station No. 5.

The water also improved at Stations Nos. 8 and 11 until April, 1913. Other disturbances in connection with the grade crossing work were going on in Lehigh Avenue, east and west from Kensington Avenue, and in this latter avenue, north and south from Lehigh Avenue from December, 1912, to August 13th, 1913, by reason of the shutting off the service pipes in the streets that fed the other lateral mains in the districts. This influence would be manifest at Stations Nos. 8, 11 and 5. The first line of pipe was cut out December 21st, 1912, and a temporary feed pipe was laid along the surface of the ground. Similar measures were taken on February 22nd, March 12th, and June 9th, 1913, respectively. During March and April, 1913, eight inch pipe lines were being laid. They were placed along the

streets and could have been contaminated before put in use. On April 30th, these pipes were connected up at Kensington and Lehigh Avenues and the water was turned on. This water went directly to Stations Nos. 5, 8, and 11, and the results are very apparent as will appear by reference to the tables. But this did not complete the work, and service pipes laid at two other street intersections had to be connected at Lehigh and Kensington Avenues and this work was in progress during June and July, and on August 13th, 1913, the remaining two connections were made and the water turned on. This would account for the pollutions that appeared in analyses of samples collected at Stations Nos. 5, 8, and 11 subsequently.

At the junction of Frankford and Lehigh Avenues, the grade crossing pipe work on the big mains was completed and they were in service June 23rd, 1912. The smaller distributing pipe lines at these intersections were not completed and put in service until September, 1912. This simply extended the disturbing influences and the contamination of the water so much further for that year.

The grade crossing work at Kensington centre, involved distinctive operations in 1912 and 1913 on a large scale, which added contamination to the water in the pipes, reversing the currents and stirring up the old mud deposits. This had not occurred before. They were accompanied by bacterial evidence of the influences these activities exerted, and consequently it is concluded that they did contribute to the turbidity and pollution of the water. It may be mentioned that the last operation occurred in the thirty inch main in Kensington Avenue north from Lehigh Avenue. This pipe between Lehigh Avenue and Budinot Street was shut off January 15th, 1913, and was again filled with water April 11th, 1913, but the end was not connected up and late in 1913 had not been connected with the Lehigh Avenue lines of the big pipe, acting as a dead end and a sort of storage reservoir. There are no service pipes branching from it. During May, 1913, on two different days hypochlorite of lime was applied in this thirty inch main. The smaller pipes were put in use April 30th, 1913.

There was a two-alarm fire on October 14th at Huntingdon and Memphis Streets in the Thirty-first Ward, but it did not effect the samples at Stations Nos. 8 and 11.

Special sampling stations in the Thirty-first Ward were operated by the City Water Bureau during the summer and in October of 1913, known as Nos. 7, 30, 31, and 50, respectively.

Station No. 7 is located in a drug store at the corner of Kensington Avenue and B Street; Station No. 30 in a drug store at the corner of Cedar and York Streets; Station No. 31 in a saloon at the corner of Frankford Avenue and Norris Streets; and Station No. 50 in a store at the corner of Coral and York Streets.

RESULTS OF ANALYSES AT SPECIAL CITY SAMPLING STATIONS IN THE THIRTY-FIRST WARD, MIDDLE KENSINGTON DISTRICT, 1913.

Date	Station No. 7.									Station No. 30.			Station No. 31.			Station No. 50.		
	May.			June.			October.			October.			October.			October.		
	Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1.	.....	.....	.....	110	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2.	.....	.....	.....	250	+	+	.....	.....	.....	72	—	—	100	+	+	.....	.....	.....
3.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4.	.....	.....	.....	320	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5.	1,100	+	+	.....	.....	.....	46	—	+	150	—	+	70	+	+	80	—	+
6.	.....	.....	.....	280	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7.	420	+	+	32	+	+	650	+	+	180	—	+	98	+	+	220	+	+
8.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9.	.....	.....	.....	150	—	+	90	+	+	110	—	+	84	—	+	77	—	+
10.	13	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11.	.....	.....	.....	29	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12.	3	—	—	.....	.....	.....	37	—	+	18	—	—	70	+	+	17	—	+
13.	.....	.....	.....	190	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14.	68	—	—	250	+	+	35	—	+	110	+	+	89	+	+	51	—	+
15.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16.	210	—	+	44	+	+	23	—	—	31	—	+	110	+	+	26	—	+
17.	240	+	+	180	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19.	530	+	+	.....	.....	.....	12	—	—	23	—	+	15	—	+	9	—	+
20.	.....	.....	.....	260	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21.	8	—	—	40	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23.	19	—	—	140	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24.	8	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25.	.....	.....	.....	110	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26.	5	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28.	16	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29.	110	+	++	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30.	88	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

These results are confirmatory and show that the same kind of water existed throughout the water pipes in the ward.

TYPHOID FEVER CASES FOR SEVERAL YEARS IN THE THIRTY-FIRST WARD BY MONTHS —POPULATION 31,000.

Month.	1911.	1912.	1913.		
			Total.	Accounted for	Unaccounted for.
January,	2	1	4	0	4
February,	5	2	2	0	2
March,	3	1	0	0	0
April,	2	1	3	0	3
May,	1	2	1	0	1
June,	2	2	3	0	3
July,	0	2	4	0	4
August,	2	2	3	2	1
September,	4	0	5	3	2
October,	3	4	1	1	0
November,	1	1	.....	.....	.....
December,	0	4	.....	.....	.....
Total,	25	22	26	6	20

Imported cases,	2
Secondary,	3
River bathing,	1
	6 for 1913

Judging from the analyses the water was good and not suspected of causing typhoid in 1911 and the water was free from B. Coli, so far as the analyses indicate, for a number of months in 1912, yet there was more typhoid in 1911 than in 1912.

The Lehigh Avenue main after relaying was put in use the latter part of June, 1912, in the vicinity of Frankford Avenue, but there had been nine cases of typhoid fever before this in the ward. It is thickly populated, a majority of the residents being wage earners—mill and factory hands—Irish and English. The houses are small, mostly rented, built in rows. The streets are well paved and the ward sewered, but many houses are unconnected. It is an old section of the city without modern plumbing. The back yards have catch basins for kitchen drainage and wash water and there are many back yard hopper flush closets. The kitchen drainage and wash water in numerous instances flow to alleys and down to street gutters and inlets.

The big main in Lehigh Avenue was put in service January 6th, 1913. If polluted with typhoid infection there should have been an outbreak within three weeks. Out of the twenty-six cases for the year, nine occurred along Lehigh Avenue, and south thereof within two or three blocks. The onsets of these cases unaccounted for were as follows:—January 3rd, 10th, 25th respectively, and two on February 13th, one each on April 1st, June 1st, and September 2nd. There were no cases along the north side of Lehigh Avenue that looked like infection from the big main. However, the new service pipe on either side of the street was a possible source of infection. The four cases to the north had their onsets March 20th, July 16th and 23rd, and August 29th, respectively.

The Thirty-first Ward cases have not been reinspected. The doctor who canvassed them sent in meagre reports.

The cases are pretty well scattered over the ward.

MILK SUPPLY OF TYPHOID FEVER CASES—1913—IN THE THIRTY-FIRST WARD.

Dealers.		Total.
One dealer had	8 cases	8 cases
One dealer had	5 cases	5 cases
One dealer had	3 cases	3 cases
Four dealers had each	1 case	4 cases
Seven dealers had		20 cases
Used condensed milk,		5 cases
Used no milk,		1 case
Total,		26 cases

The danger periods, with respect to water pollution and typhoid, for the year 1912, began on or about January 11th, June 23rd, September 15th, December 12th, and December 31st respectively. If typhoid infection occurred in the water due to the things that transpired about these dates, the onsets would appear during January and February, July and August, October and the latter half of December. There was no outbreak in the Thirty-first Ward corresponding to these periods or any other in the year 1912. Hence the pollution, if any, was small, or it became quickly diluted and was carried far beyond the immediate neighborhood and into other wards.

For the year 1913, the danger periods began January 6th, February 22nd, March 12th, April 30th, June 9th, and August 13th, respectively; therefore increased typhoid should be looked for in January and February, during March and April, May, June, July, and August, running into September for the Thirty-first Ward. These were the months when typhoid did appear, and are the months during which we are unable to account for the origin of the cases. There was, however, no outbreak of an explosive nature. The infection, if present at all, was weak. It very likely would have been carried into other wards; but the changes in the water works system were followed by bad water in the Thirty-first Ward and by a rise in typhoid. To trace a direct connection through from infection entering the pipes before they were laid in the trench to the later cases of typhoid in the Thirty-first and adjoining wards that might feel the influence is impossible, but the evidence, while not conclusive, is circumstantial and directs suspicion to this connection as a possible cause of some of the typhoid.

The conclusions respecting the typhoid in the Thirty-first Ward, after eliminating Lardner's Point water from suspicion, because the analyses of this water and of the water at the Torresdale clear water basin have shown low counts and the practical absence of B. Coli, are:— that some of the cases originated out of the ward, others were due to contact, and still others to polluted city water, the pollution coming from unknown sources, with a strong suspicion of sewage contamination accompanying pipe construction work, and from dual pipe connections, and possibly also from inefficient purification at the filter plant.

The bad water in the mains, appearing as it does in the open season of the year and in the latter half of the week, is attributed to local causes and not to happenings at Torresdale or Lardner's Point.

The Nineteenth Ward lies west of the Thirty-first Ward. It is thickly populated, 50,000 persons, out of a total population of 52,000, residing in the middle Kensington water district. In this ward are several large water mains. The new forty-eight inch steel pipe from Lardner's Point by Clearfield Street enters the Nineteenth Ward from the north in Mascher Street and extends westerly in York reducing to thirty-six inches in diameter at North American Street. The new forty-eight inch main in Lehigh Avenue reduces to thirty-six inches and terminates at Mascher Street. The old thirty-six inch main in Lehigh Avenue turns south in North American Street extending thence easterly in Susquehanna Avenue out of the ward. At Lehigh Avenue, Mascher Street, North American Street, and York Street the valves are open, and the fresh water from Lardner's Point pumping station has a circuit through the old and new large mains. From these big pipes smaller ones take the water and distribute it through lateral lines to the consumers. Judging from the gridiron character of the pipe system there is little opportunity for stagnation in the pipes.

No permanent city testing station is maintained in this ward. During October of 1913, four points were selected where a few samples were collected. In the upper part of the ward at North Fourth Street and Lehigh Avenue Station No. 44 was established, in the office of the City Bureau of Surveys for that district. Station No. 46 was at Susquehanna Avenue and Mascher Street, a faucet in the public park, this being near the central part of the ward. Southerly from it and quite near the centre of the ward, at North American and Norris Streets, was Station No. 32. Station No. 27 was in a drug store at Frankford Avenue and Oxford Street.

NINETEENTH WARD SAMPLES, OCTOBER, 1913. MIDDLE KENSINGTON WATER DISTRICT.

October.	Station No. 44. Lehigh and Fourth.			Station No. 46. Susquehanna and Mascher.			Station No. 32. N. American and Norris.			Station No. 27. Frankford and Oxford.		
	Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	75	−	−	.....	.....	.....	37	−	−	48	−	+
6,	30	−	−	40	−	−	200	+	+	60	−	+
8,	91	−	−	370	+	+	420	+	+	160	−	+
10,	34	−	−	64	−	+	98	−	+	40	−	−
13,	9	−	−	18	−	−	28	−	+	40	−	−
15,	130	−	+	62	−	+	48	−	+	130	−	+
17,	58	−	+	28	−	+	52	−	+	97	−	+
20,	41	−	+	12	−	+	13	−	+	19	−	+

On October 4th, 1913, the State Department of Health collected a sample at North Ninth and Cumberland Streets, and another at North Seventh and Dauphin Streets, both in the Nineteenth Ward. They contained respectively a total of 260 with one B. Coli present in one cubic centimeter, and a total of 320 with three B. Coli present in one cubic centimeter. On October 9th, 1913, a sample collected at Station No. 27 in the Nineteenth Ward contained a total count of 1,800 with no B. Coli.

On October 14th, the State Department of Health made a series of collections of muddy water samples from a hydrant at the corner of Dauphin and Hope Streets, first obtaining a sample from a faucet at a drug store nearby representing the ordinary water in the pipe, then opening the street hydrant and allowing the water to run full pressure for about a minute after which a sample was collected. The water was quite clear. After about ten minutes the hydrant was closed. At intervals of one hour the operation was repeated four times, making five samples in four hours. At the time the third sample was collected the water was slightly turbid for a few minutes and then cleared up, but all the other samples ran clear. The results of analyses are shown in the following table:

SERIES OF MUDDY WATER TESTS BY STATE DEPARTMENT OF HEALTH AT FIRE HYDRANT CORNER OF DAUPHIN AND HOPE STREETS—NINETEENTH WARD—OCTOBER 14, 1913.

Sample.	Place.	Time.	Bacteria per c. c.		
			Total.	Pink Colonies.	B. Coli.
1	Tap, McNeal's Drug Store,	12.35 P. M.	75	1	1
2	Hydrant,	12.50 P. M.	600	6	4
3	Hydrant,	1.45 P. M.	1,800	8	4
4	Hydrant,	2.45 P. M.	900	9	3
5	Hydrant,	3.45 P. M.	750	9	6
6	Hydrant,	4.45 P. M.	900	12	8

It is a reasonable assumption that if the hydrant flow had been continuous, muddy water would have appeared. However, B. Coli were always present and they increased with the series. The McNeal Drug store sample showed one B. Coli. This place is City Station No. 8. Early in the day a sample collected showed 220 total count and no B. Coli in one cubic centimeter. This proves that one sample a day at a station is not necessarily representative of the water throughout the twenty-four hours at that station. As soon as the velocities in the pipe there were materially increased and some sediment stirred up, the B. Coli at once increased; hence any influence that would stir up the mud in the pipes anywhere in the system would be likely to be accompanied by an increased total count and B. Coli, and this would obscure bacterial evidence of contamination from such a thing as a dual pipe connection, or pollution from newly laid water pipes, or less potable water from Lardner's Point.

In the lower part of the Nineteenth Ward, on Montgomery Avenue between Mascher and Howard Streets, new six inch water pipe was laid. The pipe was hauled to the street Tuesday, July 8th, 1913, and the work was finished Monday, July 14th. This length of street is brick paved, very rough and full of holes. It is a tenement district and dirty wash water and kitchen drainage flows down from the back alleys into the street gutters, and across the sidewalks in some places to the street gutters. On the day of the State Health Department's inspection, in the fall of 1913, there were pools of this house refuse in the gutters where the water pipes must have lain for a few days and one twelve foot length was still lying in the gutter, unused. It contained over an inch of street dirt in the bottom. The rain would flush the street gutters through this pipe. It is stated that no attempt was made by the city pipe gang to clean out the pipes before putting them in the trench.

June 16th, 1913, was the onset of a case of typhoid fever at 1749 North Mascher Street. Drainage from this house went to the back alley and thence out into the street gutter where the water pipes lay. If there was typhoid contamination of the pipes and this caused typhoid, the cases would be expected to appear in the neighborhood the latter part of July and the first of August. There were four such cases having the following onsets: July 26th, 1822 North Front; August 3rd, 1721 North Mascher; August 10th, 110 Diamond, and August 14th, 1813 North Hope. The August 14th case was a driver who went all over the city. The other cases had no unusual circumstances in connection with their histories.

The next disturbing influence in the ward was between September 10th and September 30th. In the Nineteenth Ward, on North American Street near York Street, a gate valve on a thirty-six inch main, which comes down from the old thirty-six inch in Lehigh Avenue above, and may be designated "A" was closed September 10th, 1913, and remained closed until September 27th, when it was opened for three days and again shut on September 30th. This old thirty-six inch main continues south in North American Street to Susquehanna Avenue and thence easterly in the avenue to Frankford Road, where it has several ten inch branches to the north and south in this road. The main reduces to thirty inches in diameter and continues easterly in Susquehanna Avenue to Girard Avenue, connecting with the twenty inch main in Girard Avenue. A thirty-six inch gate valve which may be called "B," corner of North Front Street and Susquehanna Avenue, was shut on September 10th, opened on September 27th and again closed on September 30th—these operations being the same and on the same dates as at the first gate. Between these two main gates "A" and "B," a distance of about 3,000 feet, two ten inch, four eight inch and three six inch gate valves were also shut off between September 10th and September 27th, for the purpose of ascertaining whether this thirty-six inch pipe leaked. Thus during this time there was a reversal of currents in a large district. On September 27th the large and the smaller gate valves were opened and for three days the original conditions of flow were reestablished. Then, on the 30th, the two big gates were closed, but not the little ones. Since then the water supplied to the big main between the two gates mentioned has come from the laterals. This big pipe, therefore, became a sort of storage reservoir and local distributing pipe.

Turbid water accompanied these operations and was noticed at faucets in different parts of the Nineteenth, Thirty-first, and Eighteenth Wards respectively, even as far as the river. The mud was stirred up and complaints were made to the City Water Bureau. The pressure increased along Lehigh Avenue and remains so. The pressure has remained about the same as formerly near the foot of Susquehanna Avenue because the Girard Avenue twenty inch pipe has been able to supply any deficiency that might otherwise occur. The October samples in these wards might be expected to reflect some of these disturbances since currents would be changed and it has been seen that mud samples were accompanied with high counts and B. Coli.

In the following table is given the typhoid fever cases in the Nineteenth Ward for several years. For the year 1913, the cases are in the water district under discussion but for the other years the entire ward is included, but this does not make a difference of over 2,000 persons, and for purposes of comparison the table will serve. There was as much typhoid in 1911 as in 1912, but in 1913, from April to October inclusive, there were fourteen cases more than for the entire year of 1912:

TYPHOID FEVER CASES FOR SEVERAL YEARS IN THE NINETEENTH WARD BY MONTHS. POPULATION 50,000.

Month.	1911.	1912.	1913.		
			Total.	Accounted for.	Unaccounted for.
January,	1	2	1	0	1
February,	1	2	1	0	1
March,	4	1	1	1	0
April,	2	3	7	1	6
May,	6	7	5	1	4
June,	5	8	11	0	11
July,	2	3	8	1	7
August,	5	5	12	2	10
September,	11	2	8	3	5
October,	3	3	7	0	7
November,	0	3	.....	.....	.....
December,	4	5	.....	.....	.....
Totals,	44	44	61	9	52

Imported cases,	4
Contact cases,	3
Secondary cases,	1
Pretzel infection,	1
	9 for 1913

There has been no recanvass of the cases in this ward. The Medical Inspector submitted meagre reports until the latter part of the year. The territory is largely residential. The condition as to surface drainage on Montgomery Avenue between Mascher and Howard Streets, already referred to, is representative of those prevailing in many parts of the ward. Other years the typhoid has appeared in cold months as well as in the warm months. During 1913, it has been very largely a summer outbreak, April being the first high month. It might be fair to assume that the increase, in the summer of 1913 over the normal for other years could be accounted for without seeking for some special thing or happening of this year as a cause. The water in the Nineteenth Ward could have been infected by the agencies that might have infected the water in the mains at the grade crossing work in the Thirty-first Ward.

There is not much to suspect from milk on the face of the record as to dealers as shown below:

MILK SUPPLY OF TYPHOID FEVER CASES—NINETEENTH WARD—1913.

One dealer had	8 cases
One dealer had	5 cases
Two dealers had four each,	8 cases
Seven dealers had two each,	14 cases
Sixteen dealers had one each,	16 cases
Twenty-seven dealers had	51 cases
Condensed milk,	2 cases
Various supplies,	3 cases
Unknown source,	3 cases
No milk,	2 cases
Total,	61 cases

There were eighteen cases among scholars, three of them occurred in May and five in June, all in separate schools. During July and August when the schools were closed there were five cases among scholars. During September and October there were five cases after the schools re-opened, one case for each separate school. Evidently the infection was not common at the schools. In the following tabular statement is given the age periods:

AGE PERIODS OF TYPHOID CASES IN THE NINETEENTH WARD—JANUARY TO OCTOBER INCLUSIVE—1913.

Age periods	Male	Female	Total cases
0- 4,	0	0	0
5- 9,	3	4	7
10-14,	4	8	12
15-19,	8	4	12
20-24,	2	5	7
25-29,	5	3	8
30-34,	0	2	2
35-39,	1	3	4
40-44,	1	1	2
45-49,	2	2	4
50 +,	1	2	3
Total,	27	34	61

Comparing the typhoid cases unaccounted for as to origin in the Nineteenth and Thirty-first Wards for the year 1913, in the latter there is an absence of any great summer rise, but such a rise is apparent in the Nineteenth Ward. Furthermore, the Nineteenth Ward cases month by month were scattered all through the ward. The comparison follows:

TYPHOID CASES UNACCOUNTED FOR IN THE NINETEENTH AND THIRTY-FIRST WARD OF THE MIDDLE KENSINGTON WATER DISTRICT, 1913.

	31st Ward Cases	19th Ward Cases
January,	4	1
February,	2	1
March,	0	0
April,	3	6
May,	1	4
June,	3	11
July,	4	7
August,	1	10
September,	2	5
October,	0	7

It is in the summer time that the Torresdale filters are most efficient. This would relieve the filtered water from suspicion, when taken in conjunction with the analyses, of being the cause of the summer outbreak during 1913, in the Nineteenth Ward. The existence of dual pipe connections to the city system in this ward is doubtful. During July there was a new pipe installation in the southern part of the ward that might have been accompanied by the introduction of typhoid infection into the water piping system there. Before this time there were operations along Lehigh and Kensington Avenues that made possible a similar introduction at those places from January on and these influences very naturally might extend into the Nineteenth Ward. more especially the eastern portion of it.

The stirring up of the mud in the system of pipes is more easily accounted for with the accompanying high bacterial count and complaints of turbidity from the consumers. While summer agencies, insanitary housing conditions or faulty drainage, need not be overlooked, the opportunities being as favorable during 1913 as they had been in prior years, yet typhoid fever was more prevalent in 1913 in the ward and the stirring up of the mud and the operation of gates were more extensive and some connection, therefore, between the bad water known to be caused by these operations and the increase in typhoid is recognized as a probability.

Be it as it may for 1913, yet the Nineteenth Ward has had a high typhoid rate in the past as will appear in the following table:

TYPHOID FEVER CASES IN THE ENTIRE NINETEENTH WARD FOR SIX YEARS.

Month.	1908	1909	1910	1911	1912	1913
January,	12	36	11	1 Lime.	2 Lime.	1 Lime.
February,	7	11 PF.	11	1 Lime.	2 Lime.	1 Lime.
March,	9	11	2	4 Lime.	1 Lime.	1 Lime.
April,	9	7	0	2 Lime.	3 Lime.	7 Lime.
May,	8 F.	3	2	6	7 Lime.	5 Lime.
June,	7	5	0	5	8 Lime.	11 Lime.
July,	5	3	3	2	3 Lime.	8 Lime.
August,	13	5	3	5	5 Lime.	12 Lime.
September,	13	12	6	11	2 Lime.	8 Lime.
October,	8	7	12	3	3 Lime.	7 Lime.
November,	3	3	10	0	3 Lime.	
December,	16	14	4 Lime.	4 Lime.	5 Lime.	
Total,	110	107	64	44	44	61

During the years 1908, 1909, and 1910 the winter months were higher in typhoid than the summer months, indicating possibly that the public water supply was not perfectly filtered. During the year 1911, the reverse was true. There was little typhoid in the cold weather and about as much in the summer as there had formerly been. This will hold true for the year 1913 with the exception that the summer typhoid has increased, pointing to the summer agencies, whatever they may be, as the cause.

The Eighteenth Ward gets its supply of water from the Lehigh Avenue thirty inch, the Susquehanna Avenue thirty inch and the Girard Avenue twenty inch mains. The twenty inch main is charged with fresh Lardner's Point water out of the new forty-eight inch "express" main at the intersection of Fourth Street and Girard Avenue. This is the first place where this forty-eight inch pipe delivers water with the exception that the Frankford Avenue twelve inch pipe is fed at Frankford Avenue.

RESULTS OF WATER ANALYSES AT CITY TESTING STATIONS IN THE EIGHTEENTH WARD, 1913.

Day	Cramp's Ship Yard. Station No. 12. June. Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	July. Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	Otis Street Wharf. Station No. 13. July. Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	August. Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	September. Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	October. Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.
1,										160	+	+				120	−	−
2,	65	−	+	170	−	−												
3,													48	+	+			
4,	760	−	+							520	+	+						
5,													25	+	+			
6,	280	+	+							160	−	+				140	+	+
7,				1,000	+	+												
8,										40	−	−	35	−	+	98	+	+
9,	39	−	+	120	+	+												
10,													110	−	−	140	−	+
11,	180	−	+	30	+	+				54	+	+						
12,													110	−	−			
13,	−	−	+							420	+	+				94	−	+
14,				54	+	+												
15,										360	−	+	12	−	+	87	+	+
16,	320	+	+	150	−	+												
17,													18	−	−	110	−	+
18,				340	+	+				62	−	+						
19,	180	+	+										38	+	+			
20,	800	+	+							110	−	+				15	−	−
21,							160	−	+									
22,										49	−	−	19	−	−	23	−	−
23,	180	+	+				72	−	−									
24,													38	−	+	54	−	+
25,	110	−	+				30	−	+	30	−	+						
26,													47	−	+			
27,	240	−	+							170	−	−				37	+	+
28,							49	−	−									
29,										120	+	+				61	−	+
30,	50	+	+				260	+	+				49	−	−			
31,																17	−	−

RESULTS OF WATER ANALYSES, AT CITY TESTING STATIONS IN THE EIGHTEENTH WARD, 1913.—Continued.

Day.	Columbia and Richmond. Station A. October.			Beach and Schackamaxon. Station B. October.			Girard Ave. and Aramingo. Station C. October.			Montgomery and Thompson. Station D. October.		
	Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.	Total Count.	B. Coli. 1 cc.	B. Coli. 10 cc.
1,	65	—	+	69	—	+	220	—	—	39	—	+
2,												
3,												
4,												
5,												
6,	180	+	+	76	+	+	420	+	+	310	—	+
7,												
8,	210	+	+	170	+	+	190	+	+	140	+	+
9,												
10,	240	+	+	98	+	+	220	+	+	140	+	+
11,												
12,												
13,	68	—	+	110	—	+	49	+	+	60	+	+
14,												
15,	140	—	+	76	+	+	180	+	+	120	+	+
16,												
17,	240	—	+	320	—	+	170	+	+	140	—	+
18,												
19,												
20,	18	—	+	17	—	—	21	—	+	21	—	+
21,												
22,												
23,												
24,												
25,												
26,												
27,												
28,												
29,												
30,												
31,												

Station No. 12 was started on June 2nd, 1913, in the Eighteenth Ward and on July 21st it was replaced by a new station, No. 13, which was carried on through October. These were put in to detect possible dual pipe connection pollutions along the Delaware River front in the ward. The stations A, B, C, and D were in use up to the 21st of October during that month. Stations A and B and stations C and D were in the southern and north-central part of the ward, respectively. All but Station No. 12 would get the water delivered from the Girard Avenue main and the Susquehanna Avenue main. Station No. 12 would represent the Lehigh Avenue main water.

Comparing Station No. 12 samples with those of Stations Nos. 11 and 5, it will be seen that there is not much difference; at any rate, not enough to prove or indicate that the contamination of the sample came from any other source than some common one. Unfortunately the samples were collected only on Mondays, Wednesdays, and Fridays at Station No. 12. There might have been dual pipe connection pollution at the Cramp ship yards and it might not have shown up more in the samples than the results obtained, and the same would be true with respect to Station No. 13.

It will be noticed that for the month of October, there was quite a similarity in the waters at Stations Nos. 11 and 13. During September, but not during August, the samples showed better water at Station No. 13 than at Station No. 11.

All of the October samples in this ward showed that polluted water was ever present, although occasionally low counts with no B. Coli were found.

The State Department of Health ran a series of tests at Station A in the Eighteenth Ward beginning October 10th. They were confirmatory of the city's tests and showed good water from the 20th of October to the 10th of November. In the following table is given a result of the State's test. On the 10th of November the river stage increased considerably. The Torresdale filtered water basin and the Lardner's Point samples rose in total counts and B. Coli appeared on the 10th, 11th, and 12th. This water was noticeable at Station No. 1 and at other stations in the city supplied with the water.

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION A—COLUMBIA AND RICHMOND STREETS, EIGHTEENTH WARD—1913.

Month.	Bacteria per c. c.		
	Total.	Pink Colonies.	B. Coli.
October			
10	400	0	0
11	400	6	0
12	550	4	3
13	250	1	0
14			
15	140	2	2
16	1,500	2	0
17	600	6	2
18	1,800	8	4
19	450	6	6
20	150	1	1
21			
22			
23	80	0	0
24	150	0	0
25	150	0	0
26			
27	49	0	0
28	400	1	0
29	80	0	0
30	60	0	0
31	80	0	0
November			
1	24	0	0
2	13	0	0
3	2	0	0
4			
5	48	0	0
6	34	0	0
7	32	0	0
8	46	0	0
9	550	2	0
10	300	4	3
11	80	2	2

TEMPORARY DROP IN EFFICIENCY OF FILTRATION AT TORRESDALE DUE AT CLOGGED FILTERS, AND A RISE IN THE RIVER, NOVEMBER 10TH, 1913, AS SHOWN BY BACTERIAL ANALYSES OF RAW, FILTERED, LARDNER'S POINT AND STATION NO. 1 SAMPLES.

Month.	Raw River.	Filtered Water Basin.	Lardner's Point.			Station No. 1.		
	Total Count.	Total Count.	Total Count.	B. Coli.		Total Count.	B. Coli.	
				1 cc.	10 cc.		1 cc.	10 cc.
Nov. 9	7,200	14						
10	47,000	120	59	+	+	60	−	−
11	36,000	140	100	-	++			
12	12,000	92	110	+	+	65	+	+
13	13,000	140	70					

This shows that the Torresdale filter plant is not an absolute barrier against sewage organisms from the river entering the water pipe system at times. The period of least efficiency or of greatest difficulty in handling the filters is in the fall and spring months and not during the summer months, from May to November, when typhoid fever is the greatest, referring now to the last three years.

The State Department of Health checked the tests at some of the 18th Ward stations during October, 1913. A sample collected at Station B on October 21st, showed a total count of 500 with no B. Coli present, and one taken on October 22nd, gave a total count of 50 with no B. Coli. A sample collected at Station D on October 9th showed a total count of 800 and three pink colonies, but no B. Coli.

The State Department of Health conducted a series of tests of muddy water samples in the 18th Ward secured at a fire hydrant at the corner of Moyer street and Montgomery Avenue, near Station D. The results are giving in the following table:

SERIES OF MUDDY WATER TESTS BY STATE DEPARTMENT OF HEALTH AT FIRE HYDRANT CORNER OF MOYER STREET AND MONTGOMERY AVENUE—EIGHTEENTH WARD—OCTOBER 14TH, 1913.

Sample.	Hour of Collection.	Bacteria per c. c.		
		Total.	Pink Colonies.	B. Coli.
1 Tap, McNamee's Hotel, ...	1:10 P. M.	125	0	0
2 Hydrant, ...	1:15 P. M.	5,000	9	6
3 Hydrant, ...	1:19 P. M.	3,000	6	4
4 Hydrant, ...	2:20 P. M.	140	0	0
5 Hydrant, ...	3:15 P. M.	50	0	0
6 Hydrant, ...	4:15 P. M.	100	1	1

Before the water was disturbed in the street pipe, a sample was collected at the tap nearby in McNamee's Hotel. This was free of sewage organisms. The street hydrant was then opened wide, throwing a stream across the street but could not be left open all the afternoon. Very thick sediment, black as coal dirt, came out. A sample was collected and this showed a high total count and sewage organisms were present. The full stream was allowed to flow and four minutes after the hydrant was opened a second sample was collected which showed similar results on analysis. In the course of twenty minutes the water had cleared up considerably, so the hydrant was closed down part way to confine the stream to the street gutter and the water allowed to flow for an hour. Then the hydrant was opened wide again and the third sample collected, this showing good water. This operation was repeated two other times, as shown in the table above and the test demonstrated what a fire might do in deteriorating the quality of the water in the pipe, or what any disturbance of the mud in the mains might do. It proves that the mud supports abundant bacterial life, including the sewage organisms. Up to November 1st, there were no big fires reported for the year in the Eighteenth Ward.

Near the foot of Shackamaxon Street are Pier No. 51 and a saw and planing mill operated by S. Vrooman and Company. Here there was a dual pipe connection consisting of a one inch city pipe to the raw river pump, used for priming. This connection was severed October 3rd, 1913.

Near the foot of Marlborough Street is the Kensington Ship Yard Company works. Several hundred men are employed. There is a dry dock and also several ship ways. Vessels are repaired. Raw river water is used for industrial purposes and fire lines. There was formerly a two inch pipe connection between the city pipes and the river water pipes, and up to July 11th, 1913 there was only one check valve on this connection and this probably leaked. On July 11th, 1913 by order of the City Water Bureau, a second check valve was put in and on September 11th, 1913 the two inch connection was severed. Undoubtedly the old check valve leaked whenever the pressure was higher in the raw river water pipe lines.

From the foot of Susquehanna Avenue to Cumberland Street along the river are the works of the William Cramp and Sons Ship and Engine Building Company. Five thousand men are employed in the construction of steam ships, war ships, and vessels of all kinds, and raw river water is used for many purposes. There was a six inch connection between the city pipes and the fire lines through the works, this having a single valve which probably leaked. A check valve was put in this line during the summer of 1913 and by October 3rd, 1913 the dual connection was severed.

These dual connections in the ship yards are considered to have been sources of contamination of the city water of some consequence. The fire pumps in the plants are tested frequently, the pressure running up much higher than that of city pipes and the tendency was towards leakage of the raw water into the city mains. This

contaminated water, during the time that the thirty inch Lehigh Avenue main was out of service—from January 11, 1912 to January 6, 1913—would quite likely take a direction of flow northward through a portion of the 31st and 25th Wards, but it is not likely that this water ever reached the 19th Ward for it always had an abundant supply of its own. During 1913, the water in the 18th Ward did not probably leave the ward after being supplied to the lateral pipes from the big mains, so that any typhoid fever which it may have caused would be found within the ward.

There have been eleven more typhoid fever cases in the 18th Ward in 1913 than in 1912. By reference to a table following it will be seen that the cases for 1912 were pretty evenly distributed throughout the year. In 1911, there were thirty-four cases, August, September, and October being the high months. For 1912, there were thirty-three cases, August being the high month. For the first ten months of 1913, there were forty-four cases, with the greatest number in August. We can account for twenty-four cases, leaving April, May, June and August as the high months for cases unaccounted for. This was before the dual connections were cut off. Where there is only a check valve, dual connection would be more likely to leak after a spring freshet, when sediment may choke the valve, or after the river water had been particularly bad and there is likely to be more typhoid in the river water in summer than in winter.

In the 18th Ward samples were collected on Monday, Wednesday, and Friday mornings by the City Water Bureau and from June to October inclusive for 1913. Summarizing the results at Stations Nos. 12 and 13 and at A, B, C, and D it will appear that Wednesday was highest in total count twelve times: Friday eleven times; and Mondays six times. B. Coli in one cubic centimeter and in ten cubic centimeters appeared an equal number of times on Mondays, Wednesdays, and Fridays. What occurred Saturdays and Sundays we do not know, but evidently the water in the pipes in the Eighteenth Ward during the summer of 1913 has been in a stirred up condition less often on Mondays in the forenoon, when the sample was taken, than on Wednesdays and Fridays.

Out of ninety-five samples analyzed by the city, forty-two contained B. Coli in one cubic centimeter and seventy-eight contained B. Coli in ten cubic centimeters. This is taken to mean that the sewage organisms was always present in the water pipes but not in all of the water in the pipes. The table showing the occurrence of typhoid fever cases by months, for three years, in the 18th Ward, is given below:

TYPHOID FEVER CASES FOR SEVERAL YEARS IN THE EIGHTEENTH WARD BY MONTHS—POPULATION 27,000.

Month.	1911.	1912.	1913.		
			Total.	Accounted for.	Unaccounted for.
January,	3	2	1	0	1
February,	0	3	4	4	0
March,	0	6	1	0	1
April,	0	0	4	1	3
May,	2	1	5	1	4
June,	4	2	6	2	4
July,	2	1	4	3	1
August,	6	7	10	6	4
September,	7	2	2	1	1
October	7	3	7	6	1
November,	2	4			
December,	1	2			
Totals,	34	33	44	24	20

Determined causes	Cases—1913.
Imported,	2
Secondary,	3
Drank River Water,	11
Shellfish raw,	4
Boating on river,	1
Raw vegetables,	1
Contact,	2
Total,	24
Unknown,	20
Total,	44

Taking out the cases accounted for, the remaining ones are pretty well scattered all over the southern half of the ward with a group near Girard Avenue and Montgomery Avenue.

The eleven victims who drank Delaware River water raw are classified as follows:

Two laborers—Cramp ship-yards, Positive	Camden ship-yards, ...Positive
One tug boat engineer, ...Positive	Richmond pier rigger, ...Positive
Tug boat fireman, ...Positive	Wharf stevedore, ...Positive
Coal barge hand; .....Positive	Power house laborer, ...Positive
Boating for pleasure, ...Positive	Two Cramp ship-yards employees Some doubt

These positive cases drank freely of the raw water while at work or on the river. The two doubtful cases are not very doubtful and reinspection might prove positively that they did drink the raw water the same as the other ship-yard laborers.

The twenty cases unaccounted for should have been reinspected. There were three cases among girls who attended the Adair School, ages twelve, thirteen, and fourteen respectively, who lived in the same neighborhood and their respective onsets were April 16th, May 26th, and June 20th. This is the only unusual circumstance relative to school children.

From June 9th to June 26th, 1913, in Girard Avenue, between Front and Columbia Streets, about 1,000 feet of eight inch pipe was relaid on either side of the street ahead of the work of resurfacing. Kitchen drainage and wash water flowed into the street gutters from several of the intersecting streets while the piping was being laid. On two of these streets typhoid fever cases were in progress. The one on Leopard Street had its onset June first, that on Sophia Street on May 24th. If these pipes were infected with typhoid the disease would have broken out where the water went which would have been to the east in the 18th Ward and the onsets would have appeared from July 1st on during the month. The fact is there was but one typhoid fever case there in July, namely at 1230 East Berks Street. The other July cases have been accounted for.

From May 24th until June 6th 1913, a line of twelve inch pipe was being laid in Montgomery Avenue between Richmond and Beach Streets. This was more a court than a street at the time. It had a dirt surface and contained a big pool of kitchen drainage and wash water. The houses have privy vaults and the neighborhood is unsanitary, and the pipes were quite likely to be polluted. There was, however, no typhoid in this block then, but subsequently there was a case on August 2nd. If typhoid infection of the pipes had occurred during construction, the disease would have broken out the last half of June and the first part of July. There was but one case of typhoid fever in July and none the last half of June in that part of the 18th Ward.

The milk in the 18th Ward is not suspected. Harbison, who is the great dealer, had nine cases among the twenty of undetermined origin, one other used no milk, one used condensed milk, and the other nine cases had separate milk dealers.

The southern half of the ward is chiefly residential. The northern part is more given over to manufacturing. The population is Irish and Polish. The dwellings are tenement houses, old, and in poor condition. The streets are paved and sewered, but a number of the houses are not connected and there is considerable drainage to alleys and thence to street gutters. Back yard water closets are general and there are also a good many dry vaults.

On August 25th, a boy aged fifteen, who was a candy sorter at 121 Crease Street, developed typhoid. There were three later onsets in the ward but not in that neighborhood.

In conclusion relative to the 18th Ward typhoid, it may be said that the cases of unknown origin practically ceased after the known dual pipe connections had been severed. The water in the pipes was as bad, if not worse, here than in the 31st and 19th Wards judging from the short time during which the analyses were made. This may have been due to local causes in the ward or the water may have been bad before entering the ward. If the latter were true, then the disturbing influences were either in the 19th or 31st Wards, due to the operation of valves and pipe lines in those wards, or it may be that the bad water at times came through from Torresdale. It is not difficult to surmise as to the cause of increased total counts and the presence of B. Coli, but at this late date, and lacking more data about the cases, it is difficult satisfactorily to account for the typhoid. Of course if the mud in the pipes can sustain the life of the "bacillus typhosus" for several years, which is contrary to accepted belief, then the increase in typhoid during the constructive season when the mud in the pipes is stirred up can be easily account for.

TYPHOID FEVER IN THE EIGHTEENTH WARD FOR THE LAST SIX YEARS.

Month.	1908	1909	1910	1911	1912	1913
January,	3	22	4	3	2	1
February,	3	5	4	0	3	4
March,	4	5	4	0	6	1
April,	3	3	2	0	0	4
May,	0	2	2	2	1	5
June,	1	1	0	4	2	6
July,	0	1	5	2	1	4
August,	5	6	5	6	7	10
September,	6	1	3	7	2	2
October,	0	3	7	7	3	7
November,	1	3	7	2	4	
December,	7	7	1	1	2	
Total,	33	58	44	34	33	44

The eastern half of the 20th Ward is in the Middle Kensington water district and the western half is in the Oak Lane water district, this latter being the high service Torresdale district, the water coming from Lardner's Point pumping station.

That part of the 20th Ward in the Middle Kensington district receives the same water that is supplied to the 16th, 17th, and 19th Wards. The new forty-eight inch Lardner's Point express main delivers water into the old thirty-six inch mains at the corner of North American and York Streets in the 19th Ward. The thirty-six inch main continues westerly in York Street and, then reducing, extends southerly in North 9th Street into the 20th Ward, where it is thirty inches in diameter, westerly in Jefferson Street and southerly in North 12th Streets to the thirty inch Girard Avenue main. This Girard Avenue main is fed with fresh Lardner's Point water off the forty-eight inch Lardner's Point express main at the intersection of Girard Avenue and Germantown Road, this intersection being the first point off this particular forty-eight inch main that water is delivered excepting at Frankford to the twelve inch pipe there as already mentioned. Hence the lateral pipes in the 20th Ward within the district are charged with a considerable quantity of fresh Lardner's Point water mixed with some of the water in the old mains that may have circulated in the 19th Ward.

In this eastern portion of the 20th Ward there is an estimated resident population of 23,000 and in the Oak Lane District of the 20th Ward a resident population of about 22,000, a total of 45,000 population for the entire ward.

Unfortunately, no samples were collected in the 20th Ward prior to October, 1913. Then for three weeks samples were collected on Mondays, Wednesdays, and Fridays. Station A was in the northeastern corner of the ward at Norris Street and Germantown Avenue. Station B was at Oxford and North 6th Streets in the central eastern part. Station C was at North 10th and Oxford Street in the central western part (Oak Lane District), Station D was at North 7th Street and Girard Avenue, and Station E at North 10th Street and Girard Avenue, both in the southern part of the ward.

In the following table the results of the analyses of samples collected at these stations are given. It will be noted that the water in the central and southern part of the ward showed occasional B. Coli, excepting the samples collected in the Oak Lane District. Station A was free from B. Coli in one cubic centimeter but the sewage organism was present in ten cubic centimeters.

ANALYSES OF CITY WATER SAMPLES COLLECTED AT SEVERAL STATIONS IN THE TWENTIETH WARD DURING THE MONTH OF OCTOBER, 1913, STATION C. REPRESENTING OAK LANE WATER AND THE OTHER STATIONS REPRESENTING MIDDLE KENSINGTON DISTRICT WATER.

October.	Station A. Norris St. and Germantown Ave.			Station B. N. Sixth and Oxford Sts.			Station C. N. Tenth and Oxford Sts.			Station D. N. Seventh and Girard Ave.			Station E. N. Tenth and Girard Ave.		
	Total Count.	B. Coli		Total Count.	B. Coli		Total Count.	B. Coli		Total Count.	B. Coli		Total Count.	B. Coli	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	55	—	—	51	—	—	82	—	—	45	—	—	100	—	—
6,	98	—	+	130	+	+	28	—	—	100	+	+	70	+	+
8,	320	—	+	160	+	+	21	—	+	120	+	+	120	—	—
10,	42	—	+	240	+	+	24	—	—	88	—	—	350	—	+
13,	18	—	+	84	—	+	13	—	—	70	+	+	100	+	+
15,	72	—	+	100	+	+	.....	.....	.....	91	+	+	35	—	+
17,	56	—	+	84	+	+	.....	.....	.....	150	+	+	95	—	+
20,	7	—	+	18	—	—	10	—	+	34	—	+	.....	.....	.....

The State Department of Health checked up Station E on October 8th, the sample containing 800 total count and four B. Coli. On October 10th Station B was checked up with a total count of 350 and no B. Coli present. This shows that the samples collected at the same station at different hours of the day give different results; but at Station C the State Department of Health collected samples daily through October and into November, the results of the analyses of which were corroborative of the city samples.

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT STATION C IN THE TWENTIETH WARD—OAK LANE DISTRICT—1913.

Date Collected.	Bacteria per c. c.			Date Collected.	Bacteria per c. c.		
	Total.	Pink Col.	B. Coli.		Total.	Pink Col.	B. Coli.
October 9,	100	0	0	October 26,	...	...	...
10,	...	...	...	27,	26	0	0
11,	100	2	0	28,	60	0	0
12,	...	...	...	29,	40	0	0
13,	30	0	0	30,	19	0	0
14,	...	...	...	31,	32	0	0
15,	200	0	0	November 1,	18	0	0
16,	120	1	0	2,	20	0	0
17,	120	2	0	3,	...	...	...
18,	100	0	0	4,	...	...	...
19,	400	0	0	5,	20	0	0
20,	30	0	0	6,	15	0	0
21,	...	...	...	7,	8	0	0
22,	...	...	...	8,	350	0	0
23,	...	...	...	9,	21	0	0
24,	...	...	...	10,	140	0	0
25,	28	0	0	11,	120	0	0

Thus is seen that the Oak Lane water samples all through October and November showed a very good water free from suspicion of pollution, yet there was typhoid fever in both districts in the 20th Ward.

TYPHOID FEVER CASES FOR 1913 IN THE TWENTIETH WARD ACCORDING TO THEIR DISTRIBUTION IN THE OAK LANE AND THE MIDDLE KENSINGTON WATER DISTRICTS. POPULATION—OAK LANE DISTRICT 22,000—POPULATION—KENSINGTON DISTRICT—23,000 —MAKING 45,000 TOTAL FOR THE ENTIRE WARD.

Month.	Middle Kensington Water Dist.			Oak Lane Water Dist.		
	Total.	Accounted for.	Un-accounted for.	Total.	Accounted for.	Un-accounted for.
January,	2	1	1	0	0	0
February,	2	0	2	1	0	1
March,	2	1	1	0	0	0
April,	4	3	1	2	1	1
May,	4	2	2	2	1	1
June,	5	0	5	1	1	0
July,	6	1	5	2	1	1
August,	5	4	1	3	2	1
September,	5	3	2	4	2	2
October,	1	0	1	1	0	1
November,	..	..	..	..	..	..
December,	..	..	..	..	..	..
Total,	36	15	21	16	8	8

Contact cases,	4	Imported cases,	3
Secondary cases,	2	River boat cases,	1
Imported cases,	7	Cramp ship-yard,	1
Milk,	2	Contact,	3
Accounted for in Kensington Dist.	15	Accounted for in Oak Lane Dist., ..	8

If, as it appears, the water in the Oak Lane District of the 20th Ward has been good this summer, then the city water in this district is not to be charged with causing the typhoid, yet it is noted from the above table that there were sixteen cases in the district compared with thirty-six in the Kensington water district of the 20th Ward where the water is under suspicion. Therefore, it is advisable to look carefully into each of the sixteen cases. None was re-inspected and the original report is meagre in information. One thing will be especially noted, namely, that the afflicted were largely of the employed class or of an age which permitted of their going about and coming in contact with infection—if they were exposed—in a manner not easily traced or apparent.

TYPHOID FEVER CASES IN THE OAK LANE DISTRICT OF THE TWENTIETH WARD FOR 1913.

Onset.	Case.	Age.	Sex.	Street.	Occupation.	Origin.
February 10, ..	S. D., ...	20	F.	N. Eleventh, ...	At home, ...	Unknown.
April 24, ...	M. B., ...	21	F.	N. Warnock, ...	Housewife, ..	Unknown.
April 28, ...	S. L., ...	14	M.	N. Ninth, ...	Errand boy, ..	Imported from down town.
May 4, ...	A. L., ...	12	F.	Montgomery Ave.,	School, ...	Contact.
May 18, ...	M. E., ...	41	F.	N. Eleventh, ...	Housewife, ..	Unknown.
June 28, ...	W. G., ...	19	M.	N. Warnock, ...	Cabin boy, ..	Delaware River boat.
July 20, ...	R. S., ...	25	F.	N. Percy, ...	Housewife, ..	Unknown.
July 25, ...	A. E., ...	30	M.	N. Eighth, ...	Tailor, ...	Imported from down town.
August 6, ...	C. D., ...	28	M.	N. Alder, ...	Machinist, ..	Cramp ship-yard.
August 10, ...	R. W., ...	24	M.	N. Warnock, ...	Driver, ...	Contact.
August 27, ...	J. M., ...	27	M.	N. Eleventh, ...	Reporter, ...	Imported from down town.
September 3,..	A. M., ...	18	F.	N. Ninth, ...	Stenographer,	Unknown.
September 3,..	C. W., ...	18	F.	N. Ninth, ...	Cashier, ...	Contact.
September 11,.	C. B., ...	23	M.	N. Park, ...	Printer, ...	Unknown.
September 24,.	J. W., ...	24	M.	N. Darien, ...	Foundry, ...	Unknown.
October 16, ...	M. S., ...	6	M.	N. Darien, ...	School, ...	Unknown.

The cases were well scattered throughout the district and throughout the year. They were mostly adults which is significant and a re-inspection would likely show that some of the unaccounted for cases contracted the disease outside of the district.

The facts relating to the thirty-six cases in the Kensington District of the 20th Ward when reviewed carefully lead to the conclusion that the origin was local to some extent. The age periods are more typical. Thirteen were school children, ten lived at home and eleven different occupations are represented. Ten different schools and fifteen milk dealers were represented.

TYPHOID FEVER CASES IN THE MIDDLE KENSINGTON DISTRICT OF THE TWENTIETH WARD FOR 1913.

Onset.	Case.	Age.	Sex.	Street.	Occupation.	Origin.
January 6, ...	E. B., ...	25	F.	N. Tenth, ...	Factory, ...	Unknown.
January 24, ...	S. K., ...	20	F.	N. Eleventh, ...	Store, ...	Imported from down town.
February 10, ..	L. S., ...	10	M.	Master, ...	School, ...	Unknown.
February 14, ..	M. B., ...	33	F.	N. Eighth, ...	School teacher.	Unknown.
March 14, ...	R. B., ...	26	F.	N. Franklin, ...	At home, ...	Unknown.
March 31, ...	M. C., ...	17	F.	Oxford, ...	Milliner, ...	Imported from down town.
April 1, ...	R. S., ...	19	F.	N. Eighth, ...	Factory, ...	Imported from down town.
April 9, ...	J. S., ...	19	M.	Oxford.	Electrician, ..	Contact.
April 12, ...	P. R., ...	21	F.	N. Marshall, ...	At home, ...	Unknown.
April 23, ...	S. B., ...	14	F.	Oxford, ...	School, ...	Contact.
May 4, ...	C. R., ...	8	F.	N. Franklin, ...	School, ...	Contact.
May 11, ...	H. B., ...	4	M.	N. Franklin, ...	At home, ...	Unknown.
May 26, ...	R. A., ...	10	F.	Oxford, ...	School, ...	Contact.
May 28, ...	J. M., ...	21	F.	N. Twelfth, ...	Housewife, ..	Unknown.
June 1, ...	A. C., ...	5	F.	N. Seventh, ...	At home, ...	Unknown.
June 3, ...	R. S., ...	8	F.	N. Seventh, ...	School, ...	Unknown.
June 16, ...	E. U., ...	12	F.	N. Hutchinson, ...	School, ...	Unknown.
June 22, ...	J. M., ...	13	M.	N. Eleventh, ...	School, ...	Unknown.
June 30, ...	A. W., ...	24	M.	N. Marshall, ...	Bookkeeper, .	Unknown.
July 1, ...	S. M., ...	45	M.	Girard Ave., ...	Motorman, ..	Unknown.
July 1, ...	A. D., ...	37	F.	N. Perth, ...	Housewife, ..	Unknown.
July 14, ...	C. K., ...	25	M.	N. Marshall, ...	Painter, ...	Imported.
July 15, ...	M. T., ...	13	F.	N. Alder, ...	School, ...	Unknown.
July 18, ...	J. G., ...	10	F.	N. Franklin, ...	School, ...	Unknown.
July 21, ...	M. P., ...	18	M.	N. Marshall, ...	Tailor, ...	Unknown.
August 1, ...	L. F., ...	17	F.	N. Seventh, ...	Seamstress, ..	Unknown.
August 7, ...	E. O., ...	13	F.	N. Perth, ...	School, ...	Secondary.
August 16, ...	C. C., ...	23	F.	N. Warnock, ...	Housewife, ..	Milk.
August 26, ...	I. S., ...	16	M.	N. Sixth, ...	School, ...	Milk.
August 29, ...	J. C., ...	3	M.	N. Warnock, ...	At home, ...	Secondary.
September 1,..	E. H., ...	27	F.	N. Franklin, ...	Housewife, ..	Unknown.
September 4,..	H. C., ...	11	M.	N. Seventh, ...	Factory, ...	Imported from down town.
September 12,	H. M., ...	12	F.	Cambridge, ...	School, ...	Imported.
September 17,	Y. S., ...	13	M.	N. Franklin, ...	School, ...	Unknown.
September 22,	N. J., ...	2	F.	Girard Ave., ...	At home, ...	Imported.
October 8, ...	J. F., ...	36	M.	N. Marshall, ...	Machinist, ...	Unknown.

The 20th Ward has had a high typhoid rate for a number of years. In 1908 and 1909 there were 113 and 117 cases respectively, mostly in the winter months. In 1910 the disease fell off nearly fifty per cent. possibly due to the introduction of other water into the district. For the last three years the supply and distribution of it has been the same as it is today, so that this period may be used for comparison. For 1911 there were thirty-four cases, eighteen occurring in the warm months from June to September inclusive. In 1912 there were forty-five cases, quite well distributed throughout the year. In 1913 the cases increased, more especially in the entire ward are as follows:

Month	Cases		
January, ...	1	June, ...	5
February, ...	3	July, ...	6
March, ...	1	August, ...	2
April, ...	2	September, ...	4
May, ...	3	October, ...	2
		Total, ...	29

TYPHOID FEVER CASES FOR THE ENTIRE TWENTIETH WARD FOR SIX YEARS. POPULATION 45,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	18	47	9	0 Lime	2 Lime	2 Lime
February,	12	11 PF.	6	1 "	5 "	3 "
March,	8	3	2	2 "	2 "	2 "
April,	12	8	2	1 "	2 "	6 "
May,	10 F.	7	2	1	5 "	6 "
June,	6	1	2	3	3 "	6 "
July,	3	4	2	3	5 "	8 "
August,	6	1	8	4	3 "	8 "
September,	7	3	7	8	5 "	9 "
October,	2	7	18	2	6 "	2 "
November,	1	8	3	2	5 "	
December,	12	17	4 Lime	7 "	2 "	
Total,	113	117	67	34	45	52

Summarizing with respect to the causes of typhoid in the 20th Ward, it is noted that there are eight unaccounted for cases in the Oak Lane water district and twenty-one in the Kensington water district. The water is suspected of being a possible medium of transmission of some of the infection, due to any one of three causes: first, unknown dual pipe connections: second, contamination of pipes before or while being laid in the trenches; and third, possibly imperfectly filtered water at Torresdale.

Other means of transmission existed: Contact in the homes or neighborhood of existing cases or anywhere outside of the ward; contact with sewage polluted water along the rivers or on boats; the infection of food stuffs and utensils, empty milk bottles not being overlooked; also flies and insects and typhoid carriers, all of which were possible agencies; other means, impossible definitely to trace because of paucity of available data. The disease was not explosive. The families of the afflicted were large, yet seldom did two cases occur in any one family, which is significant.

The 17th Ward is bounded on the east by the 18th Ward, on the north by the 19th Ward, on the west by the 20th Ward, and on the south by the 16th Ward; Girard Avenue is the dividing line between the 16th and 17th Wards. The 16th Ward is also bounded on the west by the 20th Ward and on the east by the 18th Ward and the Delaware River. Hence the two wards, the 16th and 17th, receive the same water as the surrounding wards, with this difference, that the central and eastern portions of the 16th and 17th Wards probably get fresher water since the forty-eight inch main from Lardner's Point is tapped at the intersection of North 4th Street and Girard Avenue, this being the first point where this new main delivers Torresdale water to the public, excepting the twelve inch main at Frankford Junction before mentioned More especially since September 11th, 1913, should the water in the central and eastern parts of these two wards have been fresher because of the change in valves in the 19th Ward above, which were operated since September 10th to throw more draught on the forty-eight inch main and less on the old thirty-six inch main and its connecting pipes at York and North American Streets and at Susquehanna Avenue and Front Streets in the 19th Ward. There is a twenty inch main supplied by the old main that comes down through the 17th and 16th Wards in North 4th Street, which supplies the western portions of these two wards with water that would be likely to respond to influences exerted on the distributing system in the 19th Ward.

The Frankford Avenue ten inch main, about which comment has already been made, bounds the eastern end of the Seventeenth Ward and forms a part of its pipe system.

For purposes of considering the water quality, these two wards may be classed as one district. Unfortunately, in them no testing station has been maintained by the city, except for a few months during the year 1913.

On the river front in the Sixteenth Ward at the corner of Beech and Poplar Streets testing station No. 14 was established by the City Water Bureau in June. Samples were collected Mondays, Wednesdays, and Fridays and in the following table results of analyses of them are given. The tap from which the water was drawn is in the fire house of the Philadelphia Rapid Transit Company.

ANALYSES OF CITY SAMPLES AT STATION NO. 14 IN THE SIXTEENTH WARD—BEACH AND POPLAR STREETS—1913.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1cc.	10 cc.		1cc.	10 cc.		1cc.	10 cc.		1cc.	10 cc.		1cc.	10 cc.
1.							76	+	+						
2.				—	—	+							64	—	—
3.							140	—	—	320	—	+			
4.										110	—	+			
5.							150	+	+				78	+	+
6.				35	—	+									
7.							60	—	+	16	—	+	49,000	+	+
8.				130	—	+									
9.										30	—	+	19,000	+	+
10.							18	—	—						
11.	42	—	+	8	—	—				32	—	+			
12.							90	—	+				140	—	+
13.	46	+	+												
14.				60	—	+	160	+	+	10	—	—	96	—	+
15.															
16.	85	—	+	130	+	+				91	—	—	30	+	+
17.															
18.				95	+	+	52	—	+						
19.	160	—	+							630	—	—			
20.	500	—	+				150	+	+				34	—	+
21.				45	—	—									
22.							81	—	—	29	+	+	260	+	+
23.	90	—	+	190	+	+									
24.										84	—	+	72	—	+
25.	56	—	—	21	—	+	70	—	—						
26.										33	—	—			
27.	58	—	—				140	—	+				33	—	—
28.				38	—	+									
29.							64	—	—				22	—	+
30.	16	—	—	33	+	+				360	+	+			
31.													21	—	—

These results show the best water found in the Middle Kensington water district. The samples collected on October 8th and 10th are said to have been raw Delaware River water treated for boiler purposes, but there is some question about this. For the month of June, B. Coli in one cubic centimeter appeared once in nine samples and in September twice in twelve samples. For the other three months one out of every three samples on the average showed B. Coli present. The contamination can be partly accounted for by the sediment in the old pipes for most of the pipes are old in these wards. Furthermore, the water may have felt the influence of the stirring up operations of the Nineteenth and Thirty-first Wards. In the following table is given results of special tests made in October in the Sixteenth and Seventeenth Wards.

RESULTS OF ANALYSES OF CITY SAMPLES COLLECTED IN THE SEVENTEENTH AND SIXTEENTH WARDS DURING OCTOBER, 1913.

October.	Station A—17th Ward. N. Second and Oxford Streets.			Station B—16th Ward. Girard and Frankford Avenues.			Section C—16th Ward. Poplar Street and Germantown Avenue.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1cc.	10 cc.		1cc.	10 cc.		1cc.	10 cc.
1.	.....	.....	.....	.....	.....	.....	.....	.....	.....
2.	35	—	+	85	—	—	38	—	+
3.	.....	.....	.....	.....	.....	.....	.....	.....	.....
4.	.....	.....	.....	.....	.....	.....	.....	.....	.....
5.	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.	86	—	+	140	+	+	110	—	+
7.	.....	.....	.....	.....	.....	.....	.....	.....	.....
8.	350	—	+	50	—	+	410	+	+
9.	.....	.....	.....	.....	.....	.....	.....	.....	.....
10.	320	—	—	110	—	—	70	+	+
11.	.....	.....	.....	.....	.....	.....	.....	.....	.....
12.	.....	.....	.....	.....	.....	.....	.....	.....	.....
13.	38	—	+	54	—	+	17	—	+
14.	.....	.....	.....	.....	.....	.....	.....	.....	.....
15.	93	+	+	97	—	+	54	+	+
16.	.....	.....	.....	.....	.....	.....	.....	.....	.....
17.	120	—	—	170	—	+	50	—	+
18.	.....	.....	.....	.....	.....	.....	.....	.....	.....
19.	.....	.....	.....	.....	.....	.....	.....	.....	.....
20.	23	—	—	11	+	+	22	—	+

These results also show better water than in the other wards of the Middle Kensington district. No samples were collected in the western part of the Sixteenth and Seventeenth Wards where it is supposed that there is less fresh water in the street pipes and where the consumers might be liable to feel the effects of any disturbances in the pipe system in the Nineteenth and Thirty-first Wards more than in the eastern parts of the Sixteenth and Seventeenth Wards. Perhaps by coincidence only it happens that in the year 1913 the typhoid for the Sixteenth and Seventeenth Wards was more prevalent in this western portion.

The following table is a summary of the typhoid fever cases in the Seventeenth Ward for three years:

TYPHOID FEVER CASES IN THE SEVENTEENTH WARD.

Month.	1911.	1912.	1913.		
			Total.	Accounted For.	Unaccounted For.
January,	1	3	0	0	0
February,	0	0	1	0	1
March,	2	2	0	0	0
April,	2	0	2	0	2
May,	1	1	1	1	0
June,	0	2	2	0	2
July,	0	1	4	1	3
August,	0	3	7	3	4
September,	1	0	2	0	2
October,	2	1	4	1	3
November,	2	1	..	..	..
December,	2	1	..	..	..
Total,	13	15	23	6	17

Imported cases,	2
Contact,	2
River boat,	1
Milk,	1
Accounted for,	6 for 1913

Eleven of the twenty-three cases were employed and mostly out of the ward. They went about a good deal and increased their liability to contact infection. Twelve we may class as stay-at-homes. Three were school children, six were housewives and three were living at home. Eight of these at-home cases resided in the western part of the ward, three in the central part, and one in the eastern part.

Milk is not suspected. The twenty-three cases were divided among thirteen different dealers as shown in the following table:

Milk Supply of Typhoid Fever Cases—Seventeenth Ward—1913.

Dealers.	Total Cases.
One dealer had five cases,	5
Two dealers had three cases each,	6
Two dealers had two cases each,	4
Eight dealers had one case each,	8
Thirteen dealers had	23

CASES OF TYPHOID FEVER IN THE SEVENTEENTH WARD—1913.

Cause of Infection Accounted For.

Onset.	Case.	Age.	Sex.	Street or Avenue.	Occupation.	Origin.
May 23	E. E.	17	M.	Bodine,	Hatter,	Contact at work.
July 16	E. E.	2	M.	N. Randolph,	At home,	River boat.
Aug. 11	I. S.	15	M.	Master,	Errand boy,	Imported from down town.
Aug. 20	C. B.	28	M.	N. Sixth,	Conductor,	Contact.
Aug. 30	F. R.	37	M.	Germantown Ave.,	Waiter,	Milk.
Oct. 3	M. M.	24	F.	N. Lawrence,	At home,	Imported.

Thus out of twenty-three cases six only are accounted for, which is not at all satisfactory. It will be observed that the cases were in the hot months. It was a summer outbreak. There are no known dual connections in the ward, no laying of new pipes nor relaying of old ones in the ward. The water samples collected in this ward show better water than in the other wards in the Middle Kensington district, excepting the Sixteenth. The western part of the Seventeenth Ward, where most of the stay-at-homes resided, might have felt the influence of the grade-crossing work prosecuted in the Nineteenth and Thirty-first Wards. If the water infection came from Torresdale direct or Lardner's Point, then the stay-at-homes in the eastern part of the ward should have been exposed as much as those in the western part of the ward. Unfortunately, no analyses of the water in the western half by which comparisons may be made are available. The eleven cases where the patients had employment, mostly out of the ward, were as follows:

Carpenter,	1	Laborer,	1
Errand boy,	2	Seamstress,	1
Hatter,	1	Printer,	1
Hostler,	1	Butcher,	1
Conductor,	1	Waiter,	1

Furthermore, typhoid has existed in this ward continuously. In a table following are given the cases for the last six years. In 1908, there were forty cases quite evenly distributed throughout the months. In 1909, there were sixty-five cases, with onsets mostly in the winter months. The conditions of water supply which may have been different then, may account for these two years. In 1910, there were twenty-three cases, in 1911, thirteen cases, and in 1912, fifteen cases. Up to July, 1913, the distribution of typhoid in the Seventeenth Ward was normal. It may be argued that the increase this summer was due to a specific cause or causes apart from the water supply, while not relieving the water of its due suspicion. Although the milk is thought to have been clean, there is a time from the onset of a case to the calling in of the physician and his diagnosis and delayed report to the City Hall, when the milk dealer may daily leave a filled bottle of milk at the house and remove an empty one. In this way the milk dealer may carry the infection to the next customer, particularly through the agency of the bottle. His hand grasps the neck of the bottle. It may pick up the infection from the empty bottle and the next instant place some of it on the mouth of the filled bottle that is left at the next customer's house. Thus quite innocently might the infection be spread, not very extensively, but now and then in some case. The chance exists. The probability is remote and hence cases resulting from this means of transmission might not stand out prominently enough to attract attention in a study of the record. Furthermore, any house to house vender of foodstuffs might similarly spread typhoid, and it follows that the more typhoid there is in a district, the more danger will exist from these and other agencies of transmission. Two well-known milk supplies might in this manner have caused six cases in the Seventeenth Ward from July to October inclusive, although there is no proof of it.

TYPHOID FEVER CASES FOR SIX YEARS IN THE SEVENTEENTH WARD—POPULATION 17,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	5	17	3	1 Lime.	3 Lime.	0 Lime.
February,	2	3 PF.	1	0 Lime.	0 Lime.	1 Lime.
March,	6	1	3	2 Lime.	2 Lime.	0 Lime.
April,	2	3	0	2 Lime.	0 Lime.	2 Lime.
May,	1 F.	4	0	1	1 Lime.	1 Lime.
June,	2	5	0	0	2 Lime.	2 Lime.
July,	1	0	1	0	1 Lime.	4 Lime.
August,	8	7	1	0	3 Lime.	7 Lime.
September,	3	4	4	1	0 Lime.	2 Lime.
October,	9	8	9	2	1 Lime.	4 Lime.
November,	1	2	0	2	1 Lime.	.....
December,	7	11	1 Lime.	2 Lime.	1 Lime.	.....
Total,	40	65	33	13	15	23

Taking up for consideration the typhoid cases for 1913 in the Sixteenth Ward, one remarkable thing is noted namely, that eighteen out of twenty-eight cases were engaged in daily occupation away from the home. The cases by age periods are not typical as the following table shows:

TYPHOID FEVER CASES BY AGE PERIODS IN THE SIXTEENTH WARD, 1913.

Age Period.	Cases.			Remarks.
	Male.	Female.	Total.	
5 to 9,	1	1	2	1 at school.
10 to 14,	3	2	5	4 at school.
15 to 19,	5	3	8	All employed.
20 to 24,	1	2	3	2 employed.
25 to 29,	4	1	5	All employed.
30 to 34,	1	1	2	1 employed.
35 to 39,	1	0	1	1 employed.
40 to 44,	0	1	1	Housewife.
45 to 49,	1	0	1	Employed.
Total,	17	11	28	

Of the stay-at-homes, five were school children, two lived at home and three were housewives. Six of these lived in the east part of the ward and four in the west part. Of the twenty-eight total cases there was an equal division of distribution between the east and west halves of the ward, but the cases were more scattered in the eastern half.

In the following table is given the distribution of the cases by months. The Medical Inspector's reports are so meagre that it is impossible to trace out the origin of a considerable number of cases that appear in groups and may have been caused through neighborhood contact, or infection. The ward is a textile and hosiery mill district and the population is mixed. Some of the houses are old and not provided with modern sanitary facilities, hydrants in the back yard and outside waterclosets being common. Surface drainage in back alleys may be found.

TYPHOID FEVER CASES IN THE SIXTEENTH WARD.

Month.	1911.	1912.	1913.		
			Total.	Accounted for.	Unaccounted for.
January,	0	1	0	0	0
February,	0	1	1	0	1
March,	0	1	2	0	2
April,	0	0	0	0	0
May,	0	1	4	1	3
June,	5	2	3	3	0
July,	4	1	5	1	4
August,	4	3	5	3	2
September,	4	0	4	1	3
October,	1	1	4	3	1
November,	2	4			
December,	2	3			
Total,	22	15	28	12	16

Imported cases,	2
Contact,	2
Possible neighborhood infection,	8
Possibly accounted for,	12 for 1913

There has been typhoid every summer in the ward, but more this year. In reviewing the Medical Inspector's reports a possible origin, with respect to neighborhood groups, has been noted but, for lack of information, there is little con-

firmatory evidence. None of the cases has been re-inspected. The following details, shown in tabular form, relate to cases whose origins are possibly suggested by the available evidence. Three neighborhood groups existed, "A," "B" and "C" containing ten, six and five cases respectively:

TYPHOID FEVER CASES IN THE SIXTEENTH WARD—1913—CAUSE OF INFECTION ACCOUNTED FOR.

Onset.	Case.	Age.	Sex.	Street or Ave.	Occupation.	Origin.	Group.
May 9,.....	W. R.	32	M.	N. Lawrence,	Policeman, ..	Neighborhood Inf.,..	"A"
June 1,.....	J. O.	43	F.	Leopard, ...	Housewife, ..	Neighborhood Inf.,..	"C"
June 1,.....	E. W.	22	F.	N. 3rd, ...	Housewife, ..	Imported, ...	"A"
June 22,.....	L. B.	28	M.	N. Leithgow,	Laborer, ...	Neighborhood Inf.,..	"A"
July 3,.....	E. W.	8	F.	Leopard, ...	School, ...	Neighborhood Inf.,..	"C"
Aug. 8,.....	J. S.	20	M.	N. 4th, ...	Machinist, ...	Neighborhood Inf.,..	"A"
Aug. 13,.....	F. J.	18	M.	Culbert, ...	Machinist, ...	Neighborhood Inf.,..	"A"
Aug. 20,.....	J. M.	18	M.	Dunton, ...	Hatter, ...	Contact at work.	
Sept. 27,.....	S. S.	18	M.	Germantown,	Leather worker.	Neighborhood Inf.,..	"B"
Oct. 13,.....	M. W.	16	M.	N. Randolph,	Errand boy, .	Imported from down town.	
Oct. 18,.....	A. W.	17	F.	N. Orianna, ..	Weaver, ...	Neighborhood Inf.,..	"A"
Oct. 19,.....	J. T.	15	F.	N. Orianna, ..	Seamstress, ..	Neighborhood Inf.,..	"A"

The twenty-eight cases were distributed among nineteen different milk dealers. Five had two cases each. Four patients used condensed milk only.

The five school children attended five different schools.

TYPHOID FEVER CASES FOR SIX YEARS IN THE SIXTEENTH WARD. POPULATION 16,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January, ...	10	18	3	0 Lime.	1 Lime.	0 Lime.
February, ...	4	7 PF.	1	0 Lime.	1 Lime.	1 Lime.
March, ...	2	1	3	0 Lime.	1 Lime.	2 Lime.
April, ...	7	2	0	0 Lime.	0 Lime.	0 Lime.
May, ...	4 F.	2	0	0	1 Lime.	4 Lime.
June, ...	2	0	1	5	2 Lime.	3 Lime.
July, ...	0	0	2	4	1 Lime.	5 Lime.
August, ...	8	2	2	4	3 Lime.	5 Lime.
September, ...	8	1	2	4	0 Lime.	4 Lime.
October, ...	1	0	3	1	1 Lime.	4 Lime.
November, ...	0	0	2	2	4 Lime.	.....
December, ...	6	0	1 Lime.	2 Lime.	3 Lime.	.....
Totals, ...	52	33	20	22	15	28

The year 1912 recorded the least typhoid in the Sixteenth Ward of any year, that of the year previous occuring in the summer and fall months. In 1910 there were less cases and these were evenly distributed for the entire year.

The comments already made, relative to typhoid in the Seventeenth Ward, are substantially relevant to the Sixteenth Ward. Dual pipe connections are not known.

CONCLUSIONS RELATIVE TO WATER AND TYPHOID IN THE MIDDLE KENSINGTON DISTRICT.

In the Thirty-first Ward, which is the upper one in the Middle Kensington district, the water continued to be bad for the year 1913 the same as in Ward Twenty-five adjoining, but in the Upper Kensington district. Station No. 5 in the Twenty-fifth Ward, and Station No. 11 in the Thirty-first Ward, and Station No 8 on the boundary line between the Thirty-first and the Nineteenth Wards, which is also in the Middle Kensington district, represent the same water and evidently have been subjected to the same disturbing influences in the water pipes, whatever those influences may have been, for the samples are comparable month by month and year by year at these three stations as is shown on the following table. The B. Coli in the table means the number of times B. Coli were found present in samples in one cubic centimeter. The total counts indicate the average for the month.

COMPARATIVE ANALYSES OF CITY WATER SAMPLES COLLECTED AT STATIONS NO. 5—TWENTY-FIFTH WARD, NO. 11—THIRTY-FIRST WARD, AND NO 8—ON BOUNDARY LINE BETWEEN THE THIRTY-FIRST AND NINETEENTH WARDE.

Month.	1911.				1912				1913.					
	Stations.				Stations.				Stations.					
	No. 5.	No. 8.		No. 11.	No. 5.	No. 8.		No. 11.	No. 5.		No. 8.		No. 11.	
	Total.	Total.	B. Coli.	Total.	Total.	Total.	B. Coli.	Total.	Total.	B. Coli.	Total.	B.Coli.	Total.	B. Coli.
January,	25	30	1	24	31	34	0	32	48	.....	44	0	36	.....
February,	16	16	0	18	107	89	0	85	35	.....	38	0	33	.....
March,	10	10	0	10	89	132	0	124	88	.....	90	2	59	.....
April,	14	13	0	15	64	41	1	38	265	.....	278	0	212	.....
May,	15	17	0	22	110	63	1	66	163	7	167	9	127	2
June,	36	47	0	49	38	45	1	63	175	16	176	12	148	12
July,	11	15	1	14	21	26	4	36	67	9	60	11	58	8
August,	14	28	3	23	21	22	0	23	.....	.....	93	12	90	13
September,	29	27	2	31	27	34	1	35	.....	.....	81	6	81	10
October,	24	28	2	20	18	18	1	21	94	2	76	0	68	2
November,	92	97	2	87	36	28	0	30	.....	.....	.....	.....	.....	.....
December,	28	26	1	53	68	64	1	73	.....	.....	.....	.....	.....	.....

There are scores of miles of old water pipes in the Kensington district that are seeded with innumerable bacterial forms. It is only necessary for any particular form to find favorable conditions in order to grow extensively. The water is of a higher temperature during the months that the total bacterial count increases as observed at Stations Nos. 5, 8, and 11. The above table does not bring this out prominently because it shows averages. The Delaware River water differs in quality in summer and in winter. It may be possible that all of the circumstances combined to encourage the development of the organisms in the pipes and that this accounts for some of the increase and the marked difference between Kensington water and Frankford water. The mud in the pipes contains B. Coli and the State Health Department tests suggest that the mud is likely to be and probably is a factor in the appearance of B. Coli in the Kensington samples.

It may be noted from the table that the contamination of the water at Stations Nos. 5, 8, and 11 has been greater during the year 1913 than during the years 1912 and 1911. Furthermore, the contamination increased in May and it dropped off in November. This seasonal disturbance may be attributed to the changes, improvements, and extensions in the distributing pipe system, to the increased consumption of water and the accompanying stirring up of the mud.

During this period of seasonal disturbance there was a weekly fluctuation. At Station 8 from May to October inclusive, Saturdays were the high days in bacteria in both total and sewage organisms, Mondays the lowest. The bacteria increased on Tuesdays, were present in more samples on Wednesdays, were most frequent on Saturdays, and appeared in the Sunday samples nearly as many times as on Wednesdays. Probably for the entire middle Kensington district the average peak for the poorer water began on Wednesdays and extended through to Saturday noon. The significant thing as far as may be judged is that Monday was probably uniformly low. It should be remembered that the Monday samples were collected in the forenoon and they probably represent the more quiet water of Sunday. The results are interpreted to mean that the contaminating influences were less active or ceased on Sunday and began anew and increased as the week progressed. The poorer water in the mains, appearing as it did in the open season of the year and in the latter half of the week, is attributed more to local causes and not so much to happenings at Lardner's Point or Torresdale. On the 10th of November, 1913, however, the stage of the Delaware River rose considerably and with it the sediment and bacteria increased, and on the 10th, 11th, and 12th, respectively, B. Coli appeared in the Torresdale filtered water basin and at Lardner's Point pumping station and at other points of water collection in the several districts all over the city receiving Torresdale water. This shows that the Torresdale filter plant is not an absolute barrier against sewage organisms entering the water-pipe system at times. The period of least efficiency of the filters is likely to be in the fall and spring months and not during the summer months; but, as has been seen, the typhoid for 1913 was a summer outbreak.

On Lehigh and Kensington Avenues, near where the boundaries of the Twenty-fifth, the Thirty-first and the Nineteenth Ward meet, there were extensive changes in the water mains going on throughout the first six months of the year 1913, due to the abolition of grade crossings, accompanied by the shutting off of long lengths of large controlling pipe lines and the sending of water in reverse currents around through many small distributing pipes. These operations would naturally affect the water at Stations Nos. 5, 11, and 8 and the putting of the pipes in commission again would continue the stirred up conditions of the water for a time longer.

At Lehigh and Frankford Avenues similar operations prevailed for the first six months during 1912. It will be observed that at the stations mentioned the bacterial counts for the first seven months of the year 1912, were higher than they were for the year 1911. These conditions of reverse currents and the stirring up of the old mud deposits were distinctive and it is believed that they did contribute to the turbidity and the pollution of the water in a quite extended zone.

There are no known dual pipe connections in the Thirty-first Ward but some may be found. Those existing in the Eighteenth Ward before October of 1913 would hardly have caused the seasonal and the weekly fluctuation and increase in the water contamination, it is believed, because of the remoteness of Stations Nos. 5, 8, and 11 from the river. Furtherfore, these station samples were quite uniform, indicating that they were within the same zone of influence, while the samples collected near the river were different.

From the first part to the end of September, 1911, several large and many small gate valves were operated on the big Susquehanna Avenue main and small pipes in the vicinity of North American Street in the Nineteenth Ward, followed by turbid water even as far as the river in the Eighteenth Ward.

The stirring up of the mud in the pipes and the accompanying turbidity and higher bacterial counts are more easily accounted for. But the typhoid connection with water in the mains is not so clearly demonstrated. The summer agencies, insanitary housing conditions and surface drainage were the same during the year 1913 as they had been in previous years, yet typhoid fever was more prevalent during the summer of 1913. That some connection existed between the bad water of this season and the increase in typhoid in the districts is recognized as a possibility. The infection would have to get into the mains either at the filter plant, at

Lardner's Point, through dual pipe connections, or through polluted pipes newly laid, or any or all of these. A summary of the typhoid cases for the Middle Kensington water district during 1913 is given in the following table:

TYPHOID FEVER CASES IN THE MIDDLE KENSINGTON WATER DISTRICT FOR THE YEAR 1913, JANUARY TO OCTOBER INCLUSIVE—POPULATION 164,000.

Month.	Entire Ward 31.	Most of Ward 19.	Entire Ward 18.	Part Ward 20.	Entire Ward 17.	Entire Ward 16.	
	Pop. 31,000.	Pop. 50,000.	Pop. 27,000.	Pop. 23,000.	Pop. 17,000.	Pop. 16,000.	
	Cases.	Cases.	Cases.	Cases.	Cases.	Cases.	Total.
January, ...	4	1	1	2	0	0	8
February, ...	2	1	4	2	1	1	11
March, ...	0	1	1	2	0	2	6
April, ...	3	7	4	4	2	0	20
May, ...	1	5	5	4	1	4	20
June, ...	3	11	6	5	2	3	30
July, ...	4	8	4	6	4	5	31
August, ...	3	12	10	5	7	5	42
September, ..	5	8	2	6	2	4	26
October, ...	1	7	7	1	4	4	24
Total, ..	26	61	44	36	23	28	218
Rate per 100,000,	84	122	162	156	135	175	133

As soon as the frost came out of the ground and the season had fairly opened, typhoid fever increased in every ward of the district. The two vacation months were the highest, continuing into September and October as is customary with vacation typhoid.

Some of the January, February, March, and April cases and perhaps a few in May, are possibly attributable to imperfectly filtered water from Torresdale. Some bad water may have passed through the filters in the latter part of August and the last third of September and first third of October. It should be remembered that the Middle Kensington District consumes a very large quantity of water and that the big mains from Lardner's Point express the water down into this district; but this would not account for the summer outbreak.

We can account for seventy-two of the cases. Nineteen of them were imported, thirteen were contacts, nine were secondary, eight were probably neighborhood infection, eleven drank raw river water and there were several other causes all included in the following table:

CLASSIFICATION OF TYPHOID FEVER CASES ACCOUNTED FOR DURING 1913—JANUARY TO OCTOBER, INCLUSIVE, IN WARDS OR PARTS OF WARDS LYING WITHIN THE MIDDLE KENSINGTON WATER DISTRICT.

Classification.	Wards.						Totals.
	31.	19.	18.	20.	17.	16.	
Imported, ...	2	4	2	7	2	2	19
Secondary, ...	3	1	3	2	0	0	9
River Bathing, ...	1	0	0	0	0	0	1
Contact, ...	.....	3	2	4	2	2	13
Food infection, ...	.....	1	0	0	0	0	1
Drinking raw river water,	.....	.....	11	0	0	0	11
Raw shell fish, ...	.....	.....	4	0	0	0	4
River boating, ...	.....	.....	1	0	1	0	2
Raw vegetables, ...	.....	.....	1	0	0	0	1
Milk, ...	.....	.....	.....	2	1	0	3
Neighborhood infection,..	.....	.....	.....	.....	.....	8	8
Total, ...	6	9	24	15	6	12	72

The typhoid fever cases unaccounted for might have been cleared up in many instances by reinspection or had the original inspection been made more painstakingly. The cases of undetermined origin by months are given in the following table:

TYPHOID FEVER CASES OF UNDETERMINED ORIGIN IN THE THIRTY-FIRST, EIGHTEENTH, SEVENTEENTH, AND SIXTEENTH WARDS, AND THOSE PARTS OF THE NINETEENTH AND TWENTIETH WARDS WHICH COMPRISE THE MIDDLE KENSINGTON WATER DISTRICTS—1913. POPULATION 164,000.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total.
Total cases,	8	11	6	20	20	30	31	42	26	21	218
Undetermined origin,	7	7	4	15	14	25	24	22	15	13	146

These cases of undetermined origin are not conclusive. Reinspections would probably change the table figures; and the remainder would perhaps not all be due to water. Dual pipe connections are suspected and they would operate all the months in the year. Of course one influence affects another. More typhoid infection being in the river from the city sewers this summer than other summers would naturally make the dual connections more potent as a menace throughout 1913. This does not seem, however, to be a sufficient explanation for the big summer rise in typhoid which occurred in the wards far back from the river along which the known dual connections existed. The Torresdale filtered water was comparatively good during the summer, so suspicion for the summer rise, due to bad water, is directed to the contamination possibly incident to the putting of newly laid pipes into commission. These pipes were not cleansed and disinfected and they were subject to sewage contamination on the streets and in the trenches, and it would be strange if some typhoid did not result, but it is impossible directly to trace the connection, although there are suspicious circumstances in the Twenty-fifth, Thirty-first, Eighteenth, and Nineteenth Wards. Of course, if the bacillus typhosus can live for several years in mud, in water pipes, then there is established a complete chain of evidence between the bad water of the year 1913 and the summer typhoid outbreak. It might be well to make laboratory experiments on this point.

The happenings in each ward of the district during the last six years relative to typhoid may throw some light on the probable origin of the typhoid during 1913.

TYPHOID FEVER CASES IN THE THIRTY-FIRST WARD FOR SIX YEARS. POPULATION 31,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	4	15	5	2 Lime.	1 Lime.	4 Lime.
February,	6	8 PF.	5	5 Lime.	2 Lime.	2 Lime.
March,	9	3	4	3 Lime.	1 Lime.	0 Lime.
April,	7	1	2	2 Lime.	1 Lime.	3 Lime.
May,	9 F.	1	1	1	2 Lime.	1 Lime.
June,	3	1	3	2	3 Lime.	3 Lime.
July,	1	4	1	0	3 Lime.	4 Lime.
August,	4	2	3	2	2 Lime.	3 Lime.
September,	3	3	4	4	0 Lime.	5 Lime.
October,	7	3	3	3	4 Lime.	1 Lime.
November,	5	2	4	1	1 Lime.	.....
December,	9	3	1 Lime.	0 Lime.	1 Lime.	.....
Totals,	66	44	36	25	22	26

The raw river water intake, at Lardner's Point pumping station, was closed down in July, 1907, when the Torresdale filter plant was put in operation and all of the water, whether filtered or not, was delivered from the Torresdale plant to the city. Probably, this intake has not since been opened.

In July, 1907, twenty-five slow sand filters were put in service, supplying forty million gallons of filtered water to the consumers. The balance of the water supplied was raw, from the river. In November, 1907, other units had been added and sixty million gallons of filtered water were delivered daily. On March 1st, 1908, all of the filters were in commission and the output was increased to eighty million gallons, and in May, of 1908, the maximum yield, without pre-filters, of 110,000,000 gallons daily was reached. So we may consider that from May, 1908, all of the water was filtered, although at times it was not perfectly filtered.

In February of 1909 the preliminary filters were started and they have since been in continuous service.

In December, 1910, and through to April of 1911, hypochlorite of lime was used to disinfect the effluent. Its use was discontinued until December, 1911, and since then it has been continuously applied.

With this understanding the table can be studied. The introduction of all filtered water, in May, 1908, reduced the typhoid fever, and the pre-filters reduced it further. In the period of ten months that intervened between all the water being sand filtered and the starting of the preliminary filters, there were sixty-three cases, and for the same ten month period subsequent to the installation of the pre-filters there were only twenty-seven cases. The sand filters, without pre-treated water, were unable to keep the typhoid down in the winter of 1908-1909. The winter of 1909-1910 also witnessed a lesser typhoid rise, so hypochlorite of lime disinfection was effected for the winter of 1910-11. The winter before the disinfectant was applied, in five months, November to March, inclusive, there were nineteen cases. The winter when hypochlorite of lime was applied had eighteen cases, and since the disinfectant has been continuously applied the typhoid has been less in the winter. For the winter of 1911-1912 there were five cases, and for the winter 1912-1913 there were eleven cases.

For the open season of seven months (April to October, inclusive) there has been more typhoid fever during 1913, in the Thirty-first Ward, than for any other season during the last six years, excepting 1908, which is shown in the table following:

Typhoid Fever Cases in the Thirty-first Ward in the Open Season for Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	33	13	17	14	13	20

A discussion relative to the typhoid cases in the Nineteenth Ward has already been given together with a table showing the cases for the six year period, 1908 to 1913 inclusive. It is probably true that the introduction of filtered water in May, 1908, reduced the typhoid fever but the cases occurred in spite of this purification and hence are reasonably attributable to other causes as well as water. The pre-filtered waters must have helped out some but again their effect is not as marked as would be expected. In a period of ten months that intervened between all of the water being sand filtered and the starting of the preliminary filters, there were a hundred and twenty cases, and for the same ten month period subsequent to pre-filtration there were seventy-four cases only, which is a good showing, but the reduction is not so apparent for the summer months, the saving being mostly in the cold months. The sand filters without pre-treated water were not able to keep the typhoid down in the winter of 1908-1909, the following winter witnessing a lesser typhoid rise. The next winter disinfection was used and this has been followed by a decrease in the winter typhoid.

As may be noted from the table following there has been more typhoid during the open season, April to October inclusive, for 1913 in the Nineteenth Ward than in any other season during the last five years, excepting 1908.

Typhoid Fever Cases in the Nineteenth Ward in the Open Season For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	73	42	26	34	31	58

This table brings out prominently the summer typhoid for 1913 and its significance is that the origin of the cases would naturally be sought in other causes than in imperfectly filtered water. Something happened this year or contaminating infection was more extensive.

The Eighteenth Ward lies wholly within the water district and being along the river formerly contained dual pipe connections which have been severed. A table has already been given showing the typhoid fever cases in this ward for six years and about the same effect due to the introduction of filtered water was noted in this ward as in the Nineteenth Ward. Here however for the open season for seven months, April to October inclusive, there is more typhoid fever during 1913 than for any other season during the last six years, 1908 not excepted, shown clearly in the following table:

Typhoid Fever Cases in the Eighteenth Ward in the Open Season For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	15	17	21	28	16	38

This is a striking situation not noted for any other ward thus far studied, and so it points to other causes than city water improperly filtered at Torresdale. The infection was more extensive throughout the open season in the Eighteenth Ward. If the city water contributed in any way, it probably was due to the infection of the water while in the ward and not before. There were dual pipe connections. We judge from the samples of the city water collected in the ward that the sewage organism is always present in the water pipes but not in all of the water in the pipes and this throws a strong suspicion on the dual pipe connections but would not account for the excess of summer or open season typhoid unless the river water has been more strongly impregnated with the typhoid poison this year. It should be noted, however, that the typhoid cases whose origin is undetermined practically ceased after the known dual connections were severed.

Practically the same remarks may be made about the Twentieth Ward as to the effect of the filtered water in this locality. The table showing the typhoid fever cases in the ward for six years has already been given. The sand filters and the pre-treated water alone were not able to keep down the typhoid fever rate, so disinfection was resorted to with a successful outcome. The winter before the hypochlorite of lime was applied for the five month period—November to March inclusive—there were forty-two cases, while in the following winter with the disinfection in use there were only ten cases and since the disinfectant has been continuously applied the winter typhoid has never gone back to as high a rate as obtained prior to the use of the chemical.

The table following shows the cases during the open season of the year and indicates that there were more typhoid fever cases during 1913 in the Twentieth Ward than in any other season during the last five years, except 1908.

Typhoid Fever Cases in the Twentieth Ward in the Open Season for Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	46	31	41	22	29	45

The same remarks may be applied to the Seventeenth Ward in relation to the question of water supply. A disinfectant was required apparently to keep down the typhoid fever rate in this ward and its effect is manifest in the table, showing the cases for the last six years already given.

For the open season of seven months (April to October inclusive) there was more typhoid fever during 1913 in the Seventeenth Ward than for any other season during the last five years excepting 1909.

Typhoid Fever Cases in the Seventeenth Ward in the Open Season For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	19	31	15	6	8	22

This looks as though there were local causes for the 1913 typhoid.

Practically the same facts obtain relative to the Sixteenth Ward, a discussion of which has already been given. The open season report for this ward is shown in the following table from which it appears that the typhoid fever rate for 1913 was higher in the Sixteenth Ward than for any other season during the last five years, except during 1908.

Typhoid Fever Cases in the Sixteenth Ward in the Open Season For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	30	7	10	18	8	25

It is now possible to summarize the effect of typhoid fever reduction in the Middle Kensington water district by the introduction of pre-filtered and sand filtered water. In the following table are shown the typhoid fever cases occurring in the Middle Kensington water district during the ten month period—May, 1908, to March, 1909—when sand filtered water only was supplied at Lardner's Point station and also during the ten months period from May, 1909, to February, 1910, inclusive, when the water was first mechanically filtered and then sand filtered. The typhoid fever cases are total for wards lying wholly or in part in the district.

CASES OF TYPHOID FEVER IN THE MIDDLE KENSINGTON WATER DISTRICT.

Ward.	Ten Months Before Double Filtration, May, 1908 to March, 1909.	Ten Months After Double Filtration, May, 1909 to March, 1910.
31	63	27
19	120	74
18	47	31
20	121	63
17	45	45
16	54	9
Total	430	249

So the sand filters alone did not accomplish all of the reduction. The use of the preliminary filters were followed by a reduction of forty-two per cent. in typhoid fever cases.

TYPHOID FEVER CASES DURING THE WINTER MONTHS—NOVEMBER TO MARCH INCLUSIVE—FOR THE LAST SIX YEARS IN THE MIDDLE KENSINGTON WATER DISTRICT.

Ward.	Sand Filters.	Sand and Pre-Filters.	Sand and Pre-Filters also Hypochlorite.	Sand and Pre-Filters and Hypochlorite.	Sand and Pre-Filters also Hypochlorite.
	1908-09.	1909-10.	1910-11.	1911-12.	1912-13.
	Typhoid Cases.	Typhoid Cases.	Typhoid Cases.	Typhoid Cases.	Typhoid Cases.
31,	46	19	18	5	11
19,	77	41	20	9	11
18,	46	21	11	14	12
20,	90	42	10	18	14
17,	29	20	4	9	3
16,	32	7	3	7	10
Total,	308	150	66	62	61

During the winter months when the water is the worst double filtration reduced typhoid fever sixty-five per cent. the first winter and the next winter hypochlorite of lime reduced it about in the same ratio and has kept it there ever since for the winter months.

In the table which follows the typhoid fever cases are given for the Middle Kensington water district from April to October inclusive, the cases for the entire wards being shown:

TYPHOID FEVER CASES IN THE MIDDLE KENSINGTON WATER DISTRICT DURING THE OPEN SEASON FROM APRIL TO OCTOBER INCLUSIVE FOR THE LAST SIX YEARS.

Ward.	Sand Filters. 1908.	Sand and Prefilters. 1909.	Sand and Prefilters. 1910.	Sand and Prefilters. 1911.	Sand and Prefilters and Hypochlorite. 1912.	Sand and Prefilters and Hypochlorite. 1913.
	Cases.	Cases.	Cases.	Cases.	Cases.	Cases.
31,	33	13	17	14	13	20
19,	73	42	26	34	31	58
18,	15	17	24	28	16	38
30,	46	31	41	22	29	45
17,	19	31	15	6	8	32
16,	30	7	10	18	8	25
Totals,	216	141	133	122	105	268

The general observation might be made that the preliminary filters reduced the summer typhoid as shown in the above table about thirty five per cent. The hypochlorite of lime apparently exerted but very little influence and none whatever during 1913 for the summer months. In other words the great rise in typhoid fever in the Middle Kensington district, amounting to as many cases as before preliminary filtration, was not due to Torresdale water, but to other causes, and they have been already explained above.

LOWER KENSINGTON WATER DISTRICT.

The wards contained in the Lower Kensington water district are the Fourteenth, Thirteenth, Twelfth, and Eleventh. Ward Eleven has a population of 12,000, lies along the river between Vine and Poplar Streets and south of the Sixteenth Ward. Ward Twelve lies immediately to the west and also south of the Sixteenth Ward, and has a population of 15,000. These two wards receive substantially the same kind of water as that is supplied to the Sixteenth Ward.

Ward Thirteen has a population of 20,000. It lies between Vine and Poplar Streets, is west of the Twelfth Ward and south of the Twentieth. Ward Fourteen is immediately west of Ward Thirteen and south of Ward Twenty, having a population of 19,000. The Thirteenth and Fourteenth Wards receive substantially the same water as is supplied to the lower portion of the Twentieth Ward. The four wards, forming a tier and having a total population of 67,000, are a district in themselves because they are shut off from water communication with surrounding wards except those to the north in the Middle Kensington District. Hence any water delivered in the pipe system here would be likely to remain there and circulate until used.

In Ward Eleven a sampling station was established by the City Water Bureau at North Second and Brown Streets in October, 1913. The State Health Department used this station also and in the following table are given the results of the analyses. It will be noted that during the month of October the results showed the presence of B. Coli quite frequently, but that in November and December B. Coli were absent most of the time. These results do not call for any special comment for they are not of any particular significance except as corroborative of analyses taken in wards above:

SPECIAL ANALYSES BY CITY AND STATE AT NORTH SECOND AND BROWN STREETS, WARD ELEVEN, 1913.

Days.	October.						November.			December.		
	City.			State.			State.			State.		
	Total count	B. Coli 1c.c.	B. Coli 10c.c.	Total count	Pink. col.	B. Coli. 1c.c.	Total count	Pink. col.	B. Coli. 1c.c.	Total count	Pink. col.	B. Coli. 1c.c.
1.	.....	.....	.....	.....	.....	.....	30	0	0	30	0	0
2.	120	+	+	.....	.....	.....	18	0	0	36	0	0
3.	.....	.....	.....	.....	.....	.....	100	0	0	20	0	0
4.	.....	.....	.....	.....	.....	.....	.....	.....	.....	24	0	0
5.	.....	.....	.....	.....	.....	.....	38	0	0	20	0	0
6.	79	+	+	.....	.....	.....	60	0	0	10	0	0
7.	.....	.....	.....	.....	.....	.....	48	0	0	.....	.....	.....
8.	150	—	+	700	6	4	61	0	0	24	0	0
9.	.....	.....	.....	.....	.....	.....	80	0	0	11	0	0
10.	71	+	+	550	2	1	200	3	3	16	0	0
11.	.....	.....	.....	300	0	0	10	1	1	6	0	0
12.	.....	.....	.....	452	2	1	45	0	0	14	0	0
13.	63	—	+	120	1	0	60	0	0	15	0	0
14.	.....	.....	.....	.....	.....	.....	1	0	0	.....	.....	.....
15.	84	—	+	500	3	3	32	0	0	.....	.....	.....
16.	.....	.....	.....	1,800	2	1	40	0	0	.....	.....	.....
17.	280	+	+	450	6	1	16	0	0	.....	.....	.....
18.	.....	.....	.....	1,000	1	1	10	0	0	.....	.....	.....
19.	.....	.....	.....	600	3	3	6	0	0	.....	.....	.....
20.	26	—	+	260	1	1	15	1	0	.....	.....	.....
21.	.....	.....	.....	60	0	0	13	0	0	.....	.....	.....
22.	.....	.....	.....	56	0	0	21	0	0	.....	.....	.....
23.	.....	.....	.....	80	0	0	17	0	0	.....	.....	.....
24.	.....	.....	.....	150	2	2	12	0	0	.....	.....	.....
25.	.....	.....	.....	56	0	0	8	0	0	.....	.....	.....

Days.	October.						November.			December.		
	City.			State.			State.			State.		
	Total count	B. Coli 1c.c.	B. Coli 10c.c.	Total count	Pink. col.	B. Coli. 1c.c.	Total count	Pink. col.	B. Coli. 1c.c.	Total count	Pink. col.	B. Coli. 1c.c.
26, ...	.....	.....	.....	.....	.....	.....	8	0	0	.....	.....	.....
27, ...	.....	.....	.....	36	1	0	.....	.....	.....	.....	.....	.....
28, ...	.....	.....	.....	76	0	0	13	0	0	.....	.....	.....
29, ...	.....	.....	.....	45	0	0	19	3	3	.....	.....	.....
30, ...	.....	.....	.....	39	0	0	15	0	0	.....	.....	.....
31, ...	.....	.....	.....	140	0	0	.....	.....	.....	.....	.....	.....

The typhoid fever cases in the Eleventh Ward for the last six years are shown in the following table. It will be noted that for the year 1908, there was less typhoid fever immediately after the slow sand filters were put in operation, but that for the winter of 1908-1909 there was again a rise until the preliminary filters were installed when the typhoid fever dropped off to a greater degree, but was present during the summer; but the following winter there were as many cases as in previous winters, but less in the summer of 1910. Hypochlorite of lime was applied the winter of 1910-1911, and was followed by a reduction in typhoid. It was discontinued in May and again applied in December, 1911, and has since been used continuously. There has been less typhoid reported in the Eleventh Ward for the year 1913 up to November 1st, than at any other time during the last five years. These cases were scattered all over the ward.

TYPHOID FEVER IN THE ELEVENTH WARD FOR SIX YEARS. POPULATION 12,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	10	11	4	0 Lime.	0 Lime.	0 Lime.
February,	4	3	1	2 Lime.	0 Lime.	0 Lime.
March,	4	0 PF.	0	0 Lime.	0 Lime.	0 Lime.
April,	6	0	1	2 Lime.	0 Lime.	0 Lime.
May,	4 F.	1	1	0 Lime.	2 Lime.	2 Lime.
June,	1	1	0	0	0 Lime.	0 Lime.
July,	4	4	0	1	1 Lime.	1 Lime.
August,	4	6	0	2	3 Lime.	2 Lime.
September,	2	7	3	2	3 Lime.	3 Lime.
October,	0	2	2	0	1 Lime.	0 Lime.
November,	6	2	0	0	1 Lime.	
December,	6	0	0 Lime.	0 Lime.	1 Lime.	
Totals,	45	37	12	9	12	8

The Eleventh Ward is paved and sewered. Its population is made up of mixed nationalities, Jewish, Polish, and the like, with the Jewish inhabitants predominating. It is a river ward. For the open season of seven months (April to October inclusive) there was less typhoid during 1913 than for 1912 and about the same as for the year 1910-1911.

Typhoid Fever in the Eleventh Ward in the Open Season For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	21	21	7	7	10	8

Of the eight cases of typhoid for 1913 one is thought to have been imported from down town; one charged to river water; and one a possible contact case, leaving five unaccounted for.

In the Twelfth Ward the city has maintained a sampling station—No. 15—located at 712 North Fifth Street. Here samples have been collected and total counts made for three years. The city began in May, 1913, to make B. Coli determinations. The results of analyses are shown in the following tables:

ANALYSES AT STATION NO. 15 LOCATED AT 712 NORTH FIFTH STREET—TWELFTH WARD.

Month.	1911. Total Count.			1912. Total Count.			1913. Total Count.		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
January,	18	40	8	56	260	10	54	90	10
February,	14	28	8	108	620	6	24	115	10
March,	11	15	8	69	280	15	41	240	8
April,	19	30	15	46	115	18	209	825	12
May,	25	60	10	108	350	15	199	660	5
June,	72	240	26	48	115	48	175	560	21
July,	97	165	12	31	130	10	63	140	10
August,	32	115	10	40	120	5	94	360	11
September,	57	350	10	72	500	10	180	500	18
October,	40	220	10	60	475	8	65	180	21
November,	92	270	15	35	160	10	.....	.....	.....
December,	44	175	10	67	240	10	.....	.....	.....

B. COLI DETERMINATIONS AT STATION NO. 15 FOR 1913—TWELFTH WARD.

Day.	May.			June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1c.c.	10c.c.		1c.c.	10c.c.		1c.c.	10c.c.		1c.c.	10c.c.		1c.c.	10c.c.		1c.c.	10c.c.
1										360	—	+						
2	10						70	—	—				250	—	+			
3				710	+	+				55	—	+						
4	200																	
5				356	—	+				110	+	+						
6	600						35	—	+									
7										140	+	+						
8	430			24	+	+	75	+	+				21	—	+			
9																		
10				49	—	+	10	—	—	11	—	+	27	+	+			
11	20	—	—										35	—	+			
12				22	—	—				70	—	+						
13	100	—	—															
14										190	—	+	18	—	—			
15	23	—	+	46			110	—	+									
16													68	—	—			
17							140	+	+	58	—	+						
18	120	+	+	120	+	+							500	—	—			
19				560	—	+				73	+	+						
20	180	+	+				66	—	+									
21										13	—	—	42	—	+	118	+	+
22	60	—	+	70	—	—	120	—	—									
23													126	—	+	67	—	+
24	5	—	—	80	—	+	36	—	—	20	—	—						
25				21	—	—				46	—	—	23	+	—	75	—	—
26	11	—	+				25	—	+									
27										70	—	—				33	+	—
28				24	—	—	39	+	+				33	—	+			
29																21	—	—

These results are corroborated in a general way by the tests made in other wards.

The State Department of Health on October 14th, 1913, took a series of muddy water samples at a fire hydrant at Green and Orianna Streets in the Twelfth Ward and in the following table the results of analysis are given:

SERIES OF MUDDY WATER TESTS BY STATE HEALTH DEPARTMENT AT FIRE HYDRANT AT GREEN AND ORIANNA STREETS, TWELFTH WARD, OCTOBER 14, 1913.

Sample.	Hour of Collection.	Bacteria per c. c.		
		Total.	Pink Col.	B. Coli.
1 Tap, at Barker M. & M. Store, ...	Noon, ...	80	2	2
2 Hydrant, ...	Noon, ...	350	0	0
3 Hydrant, ...	12.50 P. M., ...	140	1	1
4 Hydrant, ...	1.10 P. M., ...	140	1	1
5 Hydrant, ...	2.00 P. M., ...	200	0	0
6 Hydrant, ...	3.00 P. M., ...	140	2	1
7 Hydrant, ...	4.00 P. M., ...	150	1	0
8 Hydrant, ...	5.00 P. M., ...	120	0	0

This hydrant had been flushed early in the day by the city so that when the State at noon opened up the hydrant, nothing but clear water came out, showing that the pipe had been thoroughly flushed that morning. But the sample of the tap water at the Barker store showed B. Coli, which indicated that the stirring up of the mud had contaminated that sampling water previously.

In the following table typhoid fever cases reported for the last six years for the Twelfth ward are shown. There was an increase in typhoid fever during the summer of 1913 over that for the last two years. As in the other wards the slow sand filters at Torresdale reduced the typhoid fever somewhat, followed by a greater reduction when prefilters were added, and followed by a still greater reduction, when hypochlorite of lime was applied, for the winter months.

TYPHOID FEVER CASES IN THE TWELFTH WARD FOR SIX YEARS. POPULATION 15,000.

Month.	1908.	1909	1910.	1911.	1912.	1913.
January,	7	11	4	1 Lime.	1 Lime.	0 Lime.
February,	3	2	2	1 Lime.	0 Lime.	1 Lime.
March,	2	3 PF.	4	0 Lime.	1 Lime.	1 Lime.
April,	6	1	1	5 Lime.	0 Lime.	0 Lime.
May,	1 F.	2	0	1	0 Lime.	0 Lime.
June,	0	0	0	0	3 Lime.	2 Lime.
July,	1	0	1	1	0 Lime.	2 Lime.
August,	7	2	6	2	3 Lime.	11 Lime.
September,	7	5	4	4	3 Lime.	4 Lime.
October,	1	0	2	1	0 Lime.	0 Lime.
November,	0	1	0	1	4 Lime.	
December,	4	0	0 Lime.	1 Lime.	0 Lime.	
Totals,	39	27	24	18	15	21

In the following table are given the typhoid fever cases in the Twelfth Ward during the open season for six years:

Typhoid Fever Cases in the Twelfth Ward in the Open Season, April to October Inclusive—For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases, ...	23	10	14	14	9	19

Of the twenty-one cases, seven occurred in August in a group, the circumstances pointing to a possible neighborhood infection. This is in a locality between Poplar and Brown Streets and principally on North Lawrence and North Leigthgow Streets. Outside of this group the cases are scattered all over the ward and it is mere speculation to attempt to account for the origin of the disease. This ward is a congested residential section with a mixed population, Jews predominating. The houses are of two and three stories, closely built, mostly tenement dwellings with considerable kitchen drainage and wash water discharged into street gutters, principally in the neighborhood of the group outbreak mentioned. The streets are sewered and poorly paved.

No samples of water were collected in the Thirteenth Ward and no station has been maintained there. In character it is similar to the Twelfth Ward and gets the same water.

In the following table are given the typhoid fever cases in the Thirteenth Ward for the last six years. It will be noted that the disease was much more prevalent during the summer of 1913 than in 1912. Furthermore, the comments relative to the reduction in typhoid following slow sand filtration, pre-filtration and hypochlorite treatment made for other wards are generally applicable here:

TYPHOID FEVER CASES IN THE THIRTEENTH WARD FOR SIX YEARS. POPULATION 20,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	6	6	6	0 Lime.	1 Lime.	1 Lime.
February,	3	3	2	1 Lime.	0 Lime.	1 Lime.
March,	7	2 PF.	3	0 Lime.	2 Lime.	0 Lime.
April,	11	2	2	1 Lime.	0 Lime.	1 Lime.
May,	2	2	2	0	0 Lime.	5 Lime.
June,	3	1	0	3	1 Lime.	4 Lime.
July,	3 F.	7	3	1	3 Lime.	2 Lime.
August,	7	7	3	4	5 Lime.	3 Lime.
September,	2	2	1	10	3 Lime.	6 Lime.
October,	2	4	1	3	0 Lime.	3 Lime.
November,	1	1	1	0	1 Lime.	
December,	8	1	1 Lime.	2 Lime.	0 Lime.	
Totals,	55	38	25	25	16	26

Typhoid Fever Cases in the Thirteenth Ward in the Open Season—April to October Inclusive—For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	30	25	12	22	12	24

The twenty-six cases for 1913 were found divided into four neighborhood groups with more or less suspicion that this grouping may have had something to do with the local spread of the disease. But of the twenty-six cases two were imported from out of the city, and two possibly were secondary cases; three were children attending Warner School that looked like contact cases, leaving nineteen cases unaccounted for.

In the Fourteenth Ward there were two special sampling stations established in October, 1913. The city collected the samples and analyzed them and also established another special station in the Twelfth Ward, the results of the bacteriological tests of these waters being shown in the following table:

RESULTS OF ANALYES OF SAMPLES COLLECTED AT CITY SPECIAL STATIONS. ANALYSES IN OCTOBER, 1913.

Day.	N. 4th & Fairmount, 12th Ward.			Vine St. near Broad, 14th Ward.			N. 10th & Vine Sts., 14th Ward.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1c.c.	10c.c.		1c.c.	10c.c.		1c.c.	10c.c.
1,									
2,	120	+	+	120	—	+	27	—	—
3,									
4,									
5,									
6,	230	—	+	52	—	—	87	—	+
7,							87	—	+
8,	300	—	+	120	—	+			
9,									
10,	53	—	+	110	+	+	84	—	+
11,									
12,									
13,	62	+	+	37	—	+	82	—	+
14,									
15,	240	+	+	74	—	+	100	—	+
16,									
17,	220	+	+	51	—	+	23	—	+
18,									
19,									
20,	30	—	+	22	—	—	9	—	—

Typhoid fever cases occurring in the Fourteenth Ward for the last six years are given in the following table. Several things will be noted in studying this table. First, that the disease dropped off in 1908 after the water was filtered, but that it returned in the winter of 1908-1909. Furthermore, the preliminary filters did not seem to reduce the disease any for the year 1909, and there was plenty of typhoid in the ward during the year 1910, until hypochlorite of lime was applied in December of that year. That winter was the first one with a low typhoid rate. The summer of 1911 had less typhoid, but there was an increase in the summer of 1912 and a slightly greater increase for the year 1913.

TYPHOID CASES IN THE FOURTEENTH WARD FOR SIX YEARS. POPULATION 19,000..

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	13	14	5	1 Lime.	1 Lime.	3 Lime.
February,	10	5 PF.	0	2 Lime.	2 Lime.	1 Lime.
March,	5	6	5	0 Lime.	0 Lime.	2 Lime.
April,	8 F.	11	2	0 Lime.	0 Lime.	3 Lime.
May,	1 F.	1	3	1	0 Lime.	4 Lime.
June,	2	3	0	1	1 Lime.	3 Lime.
July,	3	2	2	4	5 Lime.	0 Lime.
August,	1	7	3	1	1 Lime.	1 Lime.
September,	3	6	1	1	2 Lime.	
October,	1	1	4	1 Lime.	0 Lime.	
November,	2	11	0 Lime.			
December,						
Totals,	56	61	26	11	20	23

Typhoid Fever Cases in the Fourteenth Ward For Six Years, Open Season—April to October, Inclusive.

Year.	1908	1909	1910	1911	1912	1913
Cases, ...	25	25	12	9	15	16

Of the twenty-two cases occurring in the year 1913, one may be charged to river water, two to imports from out of the city, one known secondary, leaving eighteen unaccounted for. Of these latter, five worked in five different restaurants and two in two different bakeries and while employed there they may have been the origin of other cases among customers. These persons were employed in the Market street district principally, where many thousands dine each day.

SUMMARY AND CONCLUSIONS RELATIVE TO THE ENTIRE KENSINGTON WATER DISTRICT INCLUDING THE UPPER, MIDDLE AND LOWER SECTIONS.

In the following table the typhoid fever cases by wards for this district for the last thirteen years are given:

TYPHOID FEVER CASES IN THE KENSINGTON WATER DISTRICT FOR THIRTEEN YEARS.

Wards.	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
45, ...	.....	.....	.....	.....	.....	.....	40	23	19	21	7	25	23
33, ...	276	423	499	531	839	766	380	60	85	39	29	22	38
31, ...	50	64	91	102	486	547	249	66	44	36	25	22	26
25, ...	137	154	249	256	876	868	316	53	73	60	32	45	55
20, ...	72	123	327	170	100	218	211	113	117	67	34	45	52
19, ...	152	175	262	187	426	651	364	110	117	64	44	44	61
18, ...	48	56	102	71	269	264	177	33	58	44	34	33	44
17, ...	14	21	73	31	36	156	123	40	65	23	13	15	23
16, ...	11	25	53	46	42	103	70	52	33	20	22	15	28
14, ...	45	65	104	98	45	111	98	56	61	26	14	20	22
13, ...	38	46	126	89	45	94	108	55	38	25	25	16	26
12, ...	27	24	79	56	31	89	43	39	27	24	18	15	21
11, ...	19	36	60	47	33	65	64	45	37	12	9	12	8
Total, ...	889	1,212	2,025	1,684	3,228	3,932	2,243	745	774	461	305	329	427

By a study of the above table it may be seen that typhoid fever increased up to the year 1906 and for that year there were over 3,900 cases in the district. The next year there were over 2,200 cases, but for the year 1908, there were 745 cases only. This marked reduction must be attributed to the filtering of the water. The increase for the first ten months of the year 1913, may be charged up, first to the fact that it was a typhoid season, and second, possibly, to some imperfectly filtered water passing into the distributing system, but it is more probable that considerable typhoid may have come from the pollution of the water in the pipes through dual connections. Furthermore, there were imported cases from out of the city, also contacts and secondary cases in the same household. There were neighborhood infections, typhoid contracted from drinking water and from contact with it, and there were a large number of cases whose origin has not been accounted for, some which may possibly be charged to infection from those coming down with the disease or convalescent from it who were employed in restaurants and public eating places.

The analyses of water collected from the mains show that there was contaminated water. Some of this contamination evidently has been due to the stirring up of muddy deposits in the pipes. The tests made by the State Health Department showed this mud to contain B. Coli. There may have been fresh sewage pollution of some of the water in the pipes accompanying the laying of new mains through neglect properly to cleanse the pipes before they were laid in the trench or before they were put in commission.

It is known that at times the preliminary filters at Torresdale are unable properly to pretreat the water, and it is known also that the sand filters at times let through water that is imperfectly filtered. Attention should first be directed to putting the Torresdale filtration plant in a condition capable of always delivering a perfectly filtered water. The city should satisfy itself that no dual connections are now in existence, and a removal of such deposits of mud in the pipes as may be necessary should be accomplished in order that muddy water never may be drawn from the taps in the dwellings and properties connected to the water works system. It is impossible to assure the water consumers of the purity of the supply as long as muddy water appears from the faucets.

TORRESDALE HIGH SERVICE-OAKLANE WATER DISTRICT.

The Torresdale High Service, or Oak Lane District, lies directly west of the Kensington District, extending west to the Queen Lane District. The northern corner of the Torresdale High Service District is at the southern border of the Wentz Farm Low Service District.

Generally speaking this Torresdale High Service District extends north from Callowhill Street to Sedgley and Allegheny Avenues and from North Seventh Street on the east to North Twenty-seventh Street and Sedgley Avenue on the west. The territory thus outlined is irregular in shape with a maximum width of one and three-quarters miles and a length of three miles north and south. In this territory 190,000 persons dwell. The district comprises the Forty-seventh Ward entire and parts of the Fifteenth, Twentieth, Twenty-eighth, Twenty-ninth, Thirty-second, Thirty-seventh, and Forty-third Wards.

The water supply for the high service district is from Lardner's Point pumping station and reaches this territory either directly through the mains or by way of the Wentz Farm reservoir, the Oak Lane Reservoir, and the Corinthian reservoir, from which latter is it possible that at times water from the Queen Lane filter plant may pass into the district. Taken as a whole the wards enumerated above receive water supplies from various sources and in the following table are shown these sources, together with populations and typhoid fever cases for the first ten months in 1913.

POPULATION AND TYPHOID FEVER IN WARDS WHOLLY OR IN PART IN THE TORRESDALE HIGH SERVICE WATER DISTRICT.

Ward.	Total Population.	Estimated Population in Water Districts.					Typhoid Fever Cases Jan. to Oct., Inclusive, 1913.					Total Cases.
		Torresdale					Torresdale.					
		Wentz Farm.	Main.	Oak Lane.	Queen Lane.	Lower Roxborough.	Wentz Farm.	Main.	Oak Lane.	Queen Lane.	Lower Roxborough.	
43,	43,260	15,000	.....	9,000	12,000	7,000	12	.....	6	1	3	22
37,	23,110	.....	.....	16,000	7,000	.....	.....	.....	8	.....	.....	8
28,	49,242	.....	.....	25,000	24,000	.....	.....	.....	11	13	.....	24
32,	40,293	.....	.....	30,000	10,000	.....	.....	.....	18	12	.....	30
20,	45,356	.....	23,000	22,000	.....	.....	.....	36	16	.....	.....	52
47,	30,002	.....	.....	30,000	.....	.....	.....	.....	28	.....	.....	28
29,	39,217	.....	.....	15,000	15,000	.....	.....	.....	8	9	.....	17
15,	47,273	.....	3,000	43,000	1,000	.....	.....	9	21	.....	.....	30
Total,	308,753	15,000	26,000	190,000	69,000	7,000	12	45	116	35	3	211

In the following table are shown the distribution of the 211 cases of typhoid fever for 1913 in these various wards by months:

Month.	Wards.								
	43	37	28	32	20	47	29	15	
January,	1	0	0	3	2	2	1	0	9
February,	3	0	0	1	3	0	0	1	8
March,	3	0	3	0	2	0	1	0	9
April,	0	0	6	4	6	0	0	0	16
May,	0	0	3	4	6	2	2	3	20
June,	1	3	0	2	6	2	0	6	20
July,	4	1	3	5	8	3	2	5	31
August,	3	1	9	4	8	8	5	8	46
September,	5	1	0	4	9	7	5	6	37
October,	2	2	0	3	2	4	1	1	15
Total,	22	8	24	30	52	28	17	30	211

The Torresdale High Service Water District territory is bounded by a line drawn as follows: Beginning in the Forty-third Ward at the corner of Sedgley Avenue and North Sixth Street, thence south on North Sixth Street to Lehigh Avenue, the southern terminal of the Forty-third Ward, thence along Lehigh Avenue west to North Eighth Street, south on North Eighth Street through the Thirty-seventh and Twentieth Wards to Jefferson Street, west on Jefferson Street to North Twelfth Street, south on North Twelfth Street to Girard Avenue thence west along Girard to North Broad Street, along North Broad Street south to Callowhill Street, west on Callowhill Street to the Schuylkill River, thence north along North Twenty-seventh Street through the Fifteenth, Twenty-ninth and Thirty-second Wards to Sedgley Avenue and along this avenue northeasterly through the Thirty-second, Twenty-eighth, Thirty-seventh, and Forty-third Wards, to the point of starting. Each ward wholly or in part in this high service district will now be discussed individually, beginning at the north and ending at the southern end of the territory with the Fifteenth Ward.

Forty-third Ward: The Forty-third Ward, as relates to typhoid fever, has already been fully discussed under the Frankford and Wentz Farm reservoir water districts and the details need not be enumerated here. Briefly, the entire ward has a population of 43,000, of whom 9,000 live in the Torresdale high service district. Here, in 1913, there were six cases of typhoid fever. Of these, three were imported and one was a contact case, leaving two unaccounted for. In the entire ward, twenty-two cases occurred, twelve in the Wentz Farm reservoir district, three in the Roxborough low service district and one in the Queen Lane. All of these were accounted for including the six in the Torresdale high service district, except seven cases. For the sake of uniformity with the wards that are to follow in this district, the table showing the typhoid fever in the Forty-third Ward for six years is repeated.

TYPHOID FEVER CASES IN THE FORTY-THIRD WARD FOR SIX YEARS. POPULATION 43,000.

Month.	1908	1909	1910	1911	1912	1913
January,	7	14	4	1	11	1
February,	3	5	6	1	7	3
March,	5	0	2	2	1	3
April,	0	4	0	4	2	0
May,	4	2	0	4	2	0
June,	0	6	1	1	1	1
July,	2	4	2	4	3	4
August,	0	4	1	3	5	3
September,	4	4	1	5	3	5
October,	2	4	9	1	3	2
November,	3	1	1	2	1	.....
December,	7	0	4	5	0	.....
Total,	37	48	31	33	39	22

The above table shows the cases of the entire ward, irrespective of water districts:

Thirty-seventh Ward: The next ward south is the Thirty-seventh. All but a small portion of the northern end of this ward is contained in the Torresdale high service district. The ward has a total population of 23,000 and it is estimated that 16,000 persons dwell in the high service district the remaining 7,000 living in the Queen Lane district, Sedgley Avenue forming the divide. The following table shows the typhoid fever cases in the entire ward for six years. It will be noted that for the last three years there was a considerable reduction in cases over the first three years shown. This may be due to more careful operation of the filter plants or possibly the use of hypochlorite of lime at the filter plants. Except for the year 1913, the location of the cases in this ward as to water districts have not been studied. For 1913, all of the cases are located in the Torresdale high service district, scattered pretty well throughout that part of the ward served with the Torresdale water.

TYPHOID FEVER CASES IN THE THIRTY-SEVENTH WARD FOR SIX YEARS. POPULATION 23,000.

Month.	1908	1909	1910	1911	1912	1913
January,	5	25	5	0	2	0
February,	3	6	4	0	3	0
March,	1	5	2	1	0	0
April,	4	5	4	0	1	0
May,	1	2	2	0	0	0
June,	0	0	1	2	2	3
July,	1	1	3	1	0	1
August,	1	2	3	3	0	1
September,	2	4	0	0	0	1
October,	0	3	1	1	0	2
November,	2	2	0	1	0	—
December,	4	0	3	2	1	—
Total,	24	55	27	11	9	8

There is nothing especially significant in the typhoid in this ward as relates to seasons as will be shown in the following table of typhoid occurring during the open season except that all of the cases for 1913 occurred during the open season from April to October inclusive. As will be shown later half of these cases are accounted for.

Typhoid Fever Cases in the Thirty-seventh Ward in the Open Season, April to October Inclusive, For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	9	17	13	7	3	8

Of the eight cases in 1913, four are of unknown origin. The causes of the other four have been determined as one imported case, two infected in contact with Delaware River water, one man having worked on a dredge and the other cruised on the river, and the remaining case a man that worked at the Greenwich coal piers where a number of cases occurred with the suspicion that the river water to which the men had access was the cause of the infection. Among the eight cases was a baker who worked at a pretzel bakery, a considerable portion of whose product was sold among school children. This man may have been the cause of infecting others through this medium.

Twenty-eighth Ward: Directly west of the southern end of the Thirty-seventh Ward lies the Twenty-eighth Ward, Susquehanna Avenue forming the southern boundary of each ward. The eastern half of the ward is in the Oak Lane district and the western half in the Queen Lane district. Sedgley Avenue, which forms the divide, passing diagonally across the ward near its centre. It is estimated that a few more persons live in the eastern than in the western end, the ward having a total population of 49,000. It is largely residential in character. The ward is five blocks wide north and south and extends west from North Broad Street to Fairmount Park near the Schuylkill River.

As will be noted in the following table, where are shown the cases of typhoid fever in the ward for six years, there has been a marked reduction in cases in the first four years of this period. For 1912 and 1913, there was no reduction over 1911. In these figures the effect of filtered water in the district is indicated. The Torresdale filtered water was introduced in 1908, the prefilters going into commission the following year. The Queen Lane filter plant was started in 1911. The cases for the open season are shown first.

Typhoid Fever Cases in the Twenty-eighth Ward in the Open Season, April to October Inclusive, For Six Years

Year.	1908	1909	1910	1911	1912	1913
Cases,	59	53	36	11	14	21

TYPHOID FEVER CASES IN THE TWENTY-EIGHTH WARD FOR SIX YEARS. POPULATION 49,000.

Month.	1908	1909	1910	1911	1912	1913
January,	28	9	8	4	5	0
February,	12	16	6	4	3	0
March,	12	9	2	0	1	3
April,	12	11	6	1	3	6
May,	9	23	1	0	1	3
June,	7	3	3	4	2	0
July,	0	10	1	0	1	3
August,	6	2	5	3	3	9
September,	14	1	9	4	4	0
October,	11	3	11	2	0	0
November,	1	0	1	2	1	.....
December,	9	4	6	5	0	.....
Total,	121	91	59	29	21	24

The twenty-four cases occurring during the first ten months of 1913 are divided almost equally between the two water districts, thirteen being located in the Queen Lane district and eleven in the Oak Lane district. These cases for 1913, by months, for each water district are shown below:

TYPHOID FEVER CASES—1913—TWENTY-EIGHTH WARD.

Month.	Oak Lane District.	Queen Lane District.	Total for Ward.
January,	0	0	0
February,	0	0	0
March,	2	1	3
April,	4	2	6
May,	2	1	3
June,	0	0	0
July,	1	2	3
August,	2	7	9
September,	0	0	0
October,	0	0	0
Total,	11	13	24

In this ward as in many others in the city the history of cases occurring in the first half of the year is incomplete and it has been difficult to assign causes of infection in many of the cases. None of the Twenty-eighth Ward cases was returned for reinvestigation. The causes as determined from the data at hand for each water district in this ward are tabulated below:

TYPHOID FEVER CASES IN THE TWENTY-EIGHTH WARD—1913. DETERMINED CAUSES OF INFECTION.

Determined Causes.	Water District.		
	Queen Lane.	Oak Lane.	Total for Ward.
Imported,	2	0	2
Contact,	1	0	1
Worked down town,	3	2	5
Driver about town,	1	0	1
River bather,	1	0	1
Used raw shell fish,	1	3	4
Total—Determined causes,	9	5	14
Unknown,	4	6	10
Total—Cases,	13	11	24

Thirty-second Ward: The Thirty-second Ward is just south of the Twenty-eighth. It is four blocks wide and extends from North Eleventh Street west to Fairmount Park. It has a population of 40,000, and is mainly residential in character Approximately 30,000 persons live in the eastern end of the ward, which is in the Torresdale high service district, terminating at Sedgley Avenue and North Twenty-seventh Street, this making up about two-thirds of the total area of the ward. West of this lies the Queen Lane district with a population estimated at 10,000.

There has been a reduction in typhoid in the years 1912 and 1913 over the preceeding four years. A table to follow shows the typhoid fever cases for six years beginning with 1908. Filtered water was introduced into a large part of the ward in 1908, when the Torresdale filters were put into commission. That the fever in this ward is not uniformly of the seasonal variety is shown in the following table:

Typhoid Fever Cases in the Thirty-second Ward in the Open Season, April to October, Inclusive, For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	40	35	25	52	12	26

The cases shown above occurred from April to October inclusive. For 1908, 1909, and 1910 these cases comprised about half the total number of cases for the year. For the next year by far the greater number of cases for the year occurred during the open season and this is also true of the years 1912 and 1913. As will be shown in the following table of cases for the entire year by months for this same period of time the use of filtered water does not appear to have greatly reduced the typhoid fever. In 1910 and 1912 there were comparatively low totals but the number of cases in 1913 for the first ten months exceeded those occurring in the entire year for 1912, all but four having onsets in the open season. This table follows:

TYPHOID FEVER CASES IN THE THIRTY-SECOND WARD FOR SIX YEARS. POPULATION 40,000.

Month.	1908	1909	1910	1911	1912	1913
January,	11	10	6	3	0	3
February,	2	8	6	3	2	1
March,	6	4	5	2	1	0
April,	5	1	1	2	1	4
May,	5	18	2	1	1	4
June,	8	3	3	2	2	2
July,	2	4	3	0	1	6
August,	5	2	1	23	4	4
September,	9	4	7	16	2	4
October,	6	3	5	3	1	3
November,	2	1	4	4	1	.....
December,	10	4	3	3	5	.....
Total,	71	62	46	67	21	30

The cases shown in the above tables are for the entire wards without any distinction as to water districts. In 1913 from January to October inclusive, thirty cases of typhoid fever occurred in the Thirty-second Ward. Eighteen of these were located in the Oak Lane District and twelve in the Queen Lane District. Their occurrence by months for each district is shown in the following table:

TYPHOID FEVER CASES IN THE THIRTY-SECOND WARD BY MONTHS IN EACH WATER DISTRICT.

Month.	Oak Lane District.	Queen Lane District.	Total for Ward.
January,	2	1	3
February,	0	1	1
March,	0	0	0
April,	1	3	4
May,	3	1	4
June,	1	1	2
July,	1	4	5
August,	3	0	0
September,	4	0	4
October,	3	1	4
Total,	18	12	30

There are no particularly significant groupings of cases in this ward, they being scattered fairly well over the entire area. No cases were returned to the city medical inspectors for reinvestigation. Of the thirty total cases fourteen are classed as unknowns. The causes of infection as determined for the other sixteen cases are shown below for each water district:

TYPHOID FEVER CASES IN THE THIRTY-SECOND WARD—1913—DETERMINED CAUSES OF INFECTION.

Determined Causes.	Water District.		
	Oak Lane District.	Queen Lane District.	Total for Ward.
Imported,	4	3	7
Contact,	0	1	1
Worked down town,	2	2	4
Used raw shell fish,	2	0	2
Doubtful diagnosis,	1	0	1
History incomplete,	0	1	1
Total,	9	7	16
Unknown,	9	5	14
Total,	18	12	30

Twentieth Ward: East of the Thirty-second Ward is the northern half of the Twentieth Ward, the southern half of this ward lying directly east of the Forty-seventh Ward. The dividing line between the Oak Lane and Main Torresdale Water Districts practically bisects the ward north and south, the eastern half of the Twentieth Ward being in the Middle Kensington Water District and the western half in the Oak Lane Water District, the entire ward, however, being supplied with Torresdale water. In the eastern half of the ward there is an estimated resident population of 23,000 and in the Oak Lane District it is estimated that 22,000 persons reside. Full details respecting the Twentieth Ward have already been given in the report of the Kensington Water District—and they need not be repeated here, except to show them in their proper relation to this high service water district. Briefly, however, fifty-two cases of typhoid fever occurred in this ward in 1913 up to the end of October. Of this number, thirty-six were in the Middle Kensington Water District and sixteen in the Oak Lane District. Of the former, fifteen have been accounted for, leaving twenty-one that must be classed as unknown. Of the sixteen in the Oak Lane district eight are accounted for and the causes of infection of the remaining eight are undetermined. Thus out of a total of fifty-two cases in the entire ward, twenty-three have been accounted for and twenty-nine are undetermined. For the sake of uniformity there are repeated here two tables showing the typhoid fever in the ward for six years and the typhoid fever for 1913, separated as to water districts as well as the determined causes for cases in each water district.

TYPHOID FEVER CASES FOR THE ENTIRE TWENTIETH WARD FOR SIX YEARS. POPULATION 45,000.

Month.	1908	1909	1910	1911	1912	1913
January,	18	47	9	0	2	2
February,	12	11	6	1	5	3
March,	8	3	2	2	2	2
April,	12	8	2	1	2	6
May,	10	7	2	1	5	6
June,	6	1	2	3	3	6
July,	3	4	2	3	5	8
August,	6	1	8	4	3	8
September,	7	3	7	8	5	9
October,	2	7	18	2	6	2
November,	7	8	3	2	5	.....
December,	22	17	4	7	2	.....
Total,	113	117	67	34	45	52

TYPHOID CASES FOR 1913 IN THE TWENTIETH WARD ACCORDING TO THEIR DISTRIBUTION IN THE OAK LANE AND THE MIDDLE KENSINGTON WATER DISTRICTS. POPULATION—OAK LANE DISTRICT 22,000; POPULATION—KENSINGTON DISTRICT 23,000. TOTAL 45,000 FOR THE ENTIRE WARD.

Month.	Middle Kensington Water District.			Oak Lane Water District.		
	Total.	Accounted for.	Unaccounted for.	Total.	Accounted for.	Unaccounted for.
January,	2	1	1	0	0	0
February,	2	0	2	1	0	1
March,	2	1	1	0	0	0
April,	4	3	1	2	1	1
May,	4	2	2	2	1	1
June,	5	0	5	1	1	0
July,	6	1	5	2	1	1
August,	5	4	1	3	2	1
September,	5	3	2	4	2	2
October,	1	0	1	1	0	1
November,	.....	.....	.....	.....	.....	.....
December,	.....	.....	.....	.....	.....	.....
Total,	36	15	21	16	8	8

Determined Causes of Infection.

Contact Cases,	4	Imported Cases,	3
Secondary Cases,	2	River Boat Case,	1
Imported Cases,	7	Cramp ship-yard,	1
Ritz Milk,	2	Contact,	3
Accounted for in Kensington District,	15	Accounted for in Oak Lane District,	8

Forty-seventh Ward. The whole of the Forty-seventh Ward is in the Oak Lane water district and lies between the Twentieth and the Twenty-ninth Wards, directly south of the Thirty-second Ward. In 1910, it had a population of 30,000. Within the confines of this ward Girard College is located. Generally speaking, the ward is given over to residential purposes. In 1913, from January to October inclusive, twenty-eight cases of typhoid fever occurred in the Forty-seventh Ward, all but two of these having their onsets during the open season. Of this total thirteen are of undetermined origin, one case has an incomplete history, and to the remaining fourteen causes of infection have been assigned, which are as follows:

Typhoid Fever Cases in the Forty-seventh Ward—1913. Determined Causes of Infection.

Imported,	7
Contact,	3
Worked down town,	3
Delaware River bather,	1
Incomplete history,	1
	15
Unknown,	13
	28

These cases are scattered generally throughout the entire ward. The only instance of more than one case in the same household is at Girard College where two of the students became ill at or near the close of the summer vacation following their return to the institution from a vacation.

Below are shown tables setting forth the onsets by months of typhoid fever cases in the ward for six years and also during the open season April to October inclusive—for the same period of time:

TYPHOID FEVER IN THE FORTY-SEVENTH WARD FOR SIX YEARS—POPULATION 30,000.

Month.	1908	1909	1910	1911	1912	1913
January,	10	1	4	0	2	2
February,	13	4	3	1	2	0
March,	10	6	7	2	1	0
April,	8	2	3	1	1	0
May,	3	12	6	0	2	2
June,	2	2	3	0	0	2
July,	3	2	2	1	0	3
August,	5	4	0	3	3	8
September,	1	1	2	3	2	1
October,	2	0	10	3	0	4
November,	3	0	2	4	0	.....
December,	2	0	1	3	0	.....
Total,	70	40	42	21	13	28

Typhoid Fever Cases in Forty-seventh Ward During the Open Season, April to October Inclusive for Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	32	29	25	11	8	26

Following the year 1908 with its seventy cases there was a material reduction of thirty cases in 1909. The following year there were about the same number of cases, a total of forty-two. The next year the number of cases had dropped to twenty-one and the total reached the following year was thirteen. In 1913, the total rose to twenty-eight. The reduction noted may be accounted for by the introduction of filtered water into the ward. The reduction during the open season for the first three years of the period is not so marked. For 1911 and 1912, the cases occurring during the open season make up about half of the total cases for the year. The typhoid for the next year—1913—is practically all in the open season and quite likely is of a seasonal nature. Of the twenty-eight cases occurring in 1913, twenty-one are of an age falling between ten and thirty *i. e.*, an age period where the patients would likely move around considerably and thus be subjected to various forms of infection.

Twenty-ninth Ward: Directly west of the Forty-seventh Ward lies the Twenty-ninth Ward, divided equally between the Oak Lane and the Queen Lane Water Districts, the line of divide being North Twenty-seventh Street. It is estimated that one-half of the ward's 30,000 population resides in each district. The ward extends from North Twenty-third Street west to Fairmount Park, a distance of ten city blocks. It is the same width north and south as the Forty-seventh Ward, seven city blocks, extending from Poplar Street to Montgomery Avenue and like the Forty-seventh Ward is mainly residential. Furthermore, the Forty-seventh Ward is about of an equal size and has approximately the same number of residents. Except for the year 1913, during the six year period from 1908 to 1913, inclusive, there have been more cases of typhoid fever in the Twenty-ninth Ward than in the Forty-seventh. In 1913, in the Forty-seventh Ward, there were twenty-eight cases, while in the same year in the Twenty-ninth, there were only seventeen, but in each ward all but two of the cases occurred during the open season. In the Twenty-ninth Ward there has been a continued reduction in the number of cases each year since 1908, when one hundred and eight cases occurred, followed the next year by seventy-three cases. The following table shows the cases occurring in each year in the entire ward, without relation to either water district, for a period of six years.

TYPHOID FEVER CASES IN THE TWENTY-NINTH WARD FOR SIX YEARS. POPULATION 30,000.

Month.	1908	1909	1910	1911	1912	1913
January,	23	13	7	1	4	1
February,	26	11	6	2	2	0
March,	11	3	3	2	1	1
April,	10	1	5	4	1	0
May,	12	27	4	2	0	2
June,	3	5	0	0	1	0
July,	2	2	6	0	2	2
August,	2	4	2	3	4	5
September,	9	1	5	4	3	5
October,	6	2	5	2	2	1
November,	1	1	0	4	0	.....
December,	3	3	3	3	1	.....
Total,	108	73	46	27	21	17

Below is shown in a table the total number of cases occurring in each year during the open season from April to October inclusive.

Typhoid Fever Cases in the Twenty-ninth Ward During the Open Season, April to October Inclusive for Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	44	42	27	15	13	15

The 1913 cases are sub-divided by water districts and by months, with determined causes of infection, in the following table:

TYPHOID FEVER CASES IN THE TWENTY-NINTH WARD BY WATER DISTRICTS BY MONTHS FOR 1913, TOGETHER WITH DETERMINED CAUSES OF INFECTION.

Month.	Oak Lane District.	Queen Lane District.	Total for Ward.
January, ...	1—contact.	0	1
February, ...	0	0	0
March, ...	0	1—unknown.	1
April, ...	0	0	0
May, ...	0	2—one downtown and one unknown.	2
June, ...	0	0	0
July, ...	—unknown.	1—imported.	2
August, ...	2—one downtown and one imported.	3—one downtown, one river bather and one unknown.	5
September, ...	3—one imported and two unknown	2—one secondary and one imported.	5
October, ...	1—downtown.	0	1
Total, ...	8	9	17

The causes of infection as determined for each water district in the Twenty-ninth Ward are tabulated below:

Determined Causes.	Water District. Oak Lane District.	Queen Lane District.	Total for Ward.
Imported, ...	2	2	4
Contact at work, ...	1	0	1
Secondary, ...	0	1	1
Worked down town, ...	2	2	4
River bather, ...	0	1	1
	5	6	11
Unknown, ...	3	3	6
Total cases, ...	8	9	17

Fifteenth Ward: The remaining ward in the Oak Lane-Torresdale high service district—is the Fifteenth. This lies south of Poplar Street, extending to Vine Street and from North Broad Street west to Fairmount Park. There are three water districts in this ward. In the extreme northwestern corner, beyond North Twenty-seventh Street, there is a small triangular shaped tract, with an estimated population of 1,000, served from the Queen Lane filter plant; along the southern edge of the ward between Callowhill and Vine Streets, there is a narrow strip of territory lying in the main Torresdale water district and here it is thought 3,000 persons dwell. The balance of the ward, comprising by far the greater part of the territory and with a population of 43,000, is in the Oak Lane high service district. This ward, too, like the others in the district now under discussion is mainly given over to residential purposes. Along the southern edge the business section encroaches somewhat

For the year 1913, January to October inclusive, there have been thirty cases of typhoid fever in the Fifteenth Ward. Of these none was located in the Queen Lane district, nine were in the main Torresdale district and twenty-one resided in the Oak Lane district. These are scattered about through the ward without any particular significance as to grouping. Causes of infection have been determined for twelve of the thirty cases, leaving eighteen unknown origin. For the cases occurring in the early part of the year, the data at the disposal of the State officials are meagre. The history of the cases with onsets later in the year was gone into more minutely by the city's medical inspectors. None of the cases have been reinvestigated. Below in tabular form are shown the cases for 1913, separated as to water districts by months, with the cause of infection where this has been determined.

TYPHOID FEVER CASES IN THE FIFTEENTH WARD BY WATER DISTRICTS BY MONTHS FOR 1913, TOGETHER WITH DETERMINED CAUSES OF INFECTION.

Month.	Oak Lane District.	Main Torresdale.	Queen Lane District.	Total for ward.
January,	0	0	0	0
February,	0	1, unknown.	0	1
March,	0	0	0	0
April,	0	0	0	0
May,	2, unknown.	1, unknown.	0	3
June,	4, downtown, or unknown (3).	2, unknown.	0	6
July,	4, downtown, imported, or unknown (2).	1, imported.	0	5
August,	6, downtown, unknown (3), imported, public bath.	2, imported.	0	8
September,	4, Delaware River, doubtful diagnosis, or unknown (2).	2, imported, or unknown.	.....	6
October,	1, unknown.	0	0	1
Total,	21	9	0	30

Determined Causes of Infection.	Water District.			
	Oak Lane District.	Main Torresdale.	Queen Lane District.	Total for ward.
Imported,	2	4	0	6
Worked downtown,	3	0	0	3
On Delaware River,	1	0	0	1
Frequented public bath,	1	0	0	1
Doubtful diagnosis,	1	0	0	1
	8	4	0	12
Unknown,	13	5	0	18
Total cases,	21	9	0	30

TYPHOID FEVER CASES IN THE FIFTEENTH WARD FOR SIX YEARS. POPULATION 47,000.

Month.	1908	1909	1910	1911	1912	1913
January,	28	3	8	1	3	0
February,	35	8	8	1	2	1
March,	20	2	6	1	2	0
April,	16	3	7	2	1	0
May,	7	33	4	3	3	3
June,	1	8	3	3	0	6
July,	1	3	4	2	2	5
August,	6	9	5	0	6	8
September,	15	8	5	11	2	6
October,	9	5	14	5	3	1
November,	2	7	2	4	1	.....
December,	7	15	3	3	1	.....
Total,	147	104	69	36	26	30

Typhoid Fever Cases in the Fifteenth Ward in the Open Season, April to October, Inclusive, For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	55	69	42	26	17	29

As will be noted from the above table there was considerable typhoid fever in this ward in 1908 and 1909, followed by a material reduction in the next year. In 1911, it again dropped noticeably and for the two remaining years there has not been much change except that in 1913, for ten months, the total is higher than for the proceeding year by four cases. All but one of the thirty cases in 1913, occurred during the open season. The reduction beginning with 1910 very probably reflects a more general use of filtered water in the district, helped somewhat by the addition of hypochlorite of lime beginning the latter part of 1910.

Possibly some of the 1913 typhoid is seasonal as twenty-five of the thirty cases occurred from June to September inclusive and over half of the patients fall into the class that moves around considerably, that is from ten to thirty years of age. This group includes five school children, cases of undetermined origin where onsets occurred during the vacation period.

An interesting feature of the typhoid fever in the group of wards just discussed relates to the age periods. For the eight wards details respecting the ages of the patients for each ward entire are shown in the following table:

TYPHOID FEVER CASES BY AGES IN WARDS WHOLLY OR IN PART IN THE TORRESDALE HIGH SERVICE WATER DISTRICT.

Age Period.	Ward.								Total Cases.
	43	37	28	32	20	47	29	15	
0- 4,	1	0	1	0	3	0	0	1	6
5- 9,	3	0	1	3	4	0	0	4	15
10-14,	1	0	3	4	13	5	2	4	32
15-19,	2	1	1	4	9	6	0	3	26
20-24,	8	3	5	4	10	6	8	3	47
25-29,	2	1	5	4	7	4	4	7	34
30-34,	3	1	1	2	2	3	0	4	16
35-39,	1	1	2	1	2	1	1	1	10
40-44,	0	1	2	2	1	0	0	0	6
45-49,	0	0	2	2	1	0	1	1	7
50+,	1	0	1	4	0	3	1	2	12
Total cases,	22	8	24	30	52	28	17	30	211

Age Period.	Classification.	Cases.	
0- 4,	Infants,	6	
5- 9,	Children,	15	160 or 75%
10-19,	Minors,	58	
20-29,	Of age,	81	
30-49,	Mid age,	39	51 or 25%
50+,	Old age,	12	
Total,		211	

From the above it may be perceived that 160 or seventy-five per cent. of the total cases are under thirty years of age and all but twenty-one of these fall into the age period from ten to twenty-nine or that period of life when one naturally expects considerable activity and moving about, affording many opportunities for infection. On the other hand these figures are significant since in a water-borne infection more cases are expected in the younger age periods than in persons having reached a greater age. This is especially marked under circum-

stances where a filtered water supply to the public is of comparatively recent occurrence because the older persons to a greater or less extent have became immunized as it were by long continued use of a water supply that is not above suspicion.

The table following shows the determined causes of infection for this entire district separated according to the various water districts entering the wards which are wholly or in part in the Torresdale high service district.

DETERMINED CAUSES OF INFECTION OF TYPHOID CASES IN WARDS WHOLLY OR IN PART IN THE TORRESDALE HIGH SERVICE DISTRICT.

Determined Causes.	Water Districts.					Total.
	Torresdale.			Queen Lane.	Lower Roxborough.	
	Wentz Farm.	Main.	Oak Lane.			
Imported,	6	11	22	8	2	49
Secondary,	1	2	.....	1	.....	4
Contacts,	.....	4	8	2	.....	14
Contact with river water:						
River bathers,	.....	.....	1	2	.....	3
Worked on dredge,	.....	.....	1	.....	.....	1
Travelled on boats,	.....	.....	3	.....	.....	3
Worked on Greenwich Pier,	.....	.....	1	.....	.....	1
Cramps Ship-yard,	.....	.....	1	.....	.....	1
Not typhoid,	.....	.....	.....	.....	1	1
Doubtful diagnosis,	.....	.....	2	.....	.....	2
Possible oyster infection,	.....	.....	5	1	.....	6
Worked downtown,	.....	.....	12	7	.....	19
Driver about town,	.....	.....	.....	1	.....	1
Milk,	.....	2	.....	.....	.....	2
History incomplete,	.....	.....	1	1	.....	2
Frequented public baths,	.....	.....	1	.....	.....	1
Total determined causes,	7	19	58	23	3	110
Unknown,	5	26	58	12	0	101
Total cases,	12	45	116	35	3	211

Dual Pipe Connections: In this district there were only two dual pipe connections, these being located in industrial plants in the extreme southeastern corner of the Fifteenth Ward. One was in the plant of the Philadelphia Electric Company situated near the Schuylkill River at North Twenty-sixth and Callowhill Streets. Here two pumps of 3,000 gallons a minute capacity are maintained for pumping river water into the plant where it is used for boiler feed and for fire protection. There is also a fire pump at the plant. Prior to September 22nd, 1913, a two inch pipe connection was maintained between the city mains and the plant for boiler feed, but on this date a new line of pipe was installed and a separation of the raw river water and the city water pipe line was effected.

The other dual pipe connection was in the plant of the S. B. & B. W. Fleisher Company at the northeast corner of North Twenty-fifth and Hamilton Streets. Here a fire pump was maintained with a twelve inch suction to a well and an eight inch discharge line connected directly to the six inch city water line. Steps were being taken to break this connection on the date the Chief Engineer of the State Department of Health investigated this plant. Neither the city nor the State maintained sampling stations anywhere in the vicinity of these two plants, consequently no data are available showing what effect, if any, these dual pipe connections may have had on the city's drinking supply.

In the following table the typhoid fever cases occurring in wards wholly or in part in the Oak Lane water district are shown, from 1901 to 1913 inclusive:

TYPHOID FEVER IN WARDS WHOLLY OR IN PART IN THE TORRESDALE HIGH SERVICE DISTRICT, 1901-1913, INCLUSIVE.

Wards.	Year.												
	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
20, ...	72	123	327	170	100	218	211	113	117	67	34	45	52
43, ...	.....	.....	.....	.....	.....	142	105	37	48	31	33	39	22
47, ...	32	53	155	69	76	122	118	24	55	27	11	9	8
38, ...	130	217	549	196	156	343	283	121	91	59	29	24	24
32, ...	71	111	274	125	70	221	177	71	62	46	67	21	30
47, ...	.....	.....	.....	.....	.....	.....	.....	70	40	42	31	13	28
29, ...	179	261	483	281	202	351	300	108	73	46	27	21	17
15, ...	108	168	310	211	116	314	301	117	104	69	36	26	30
Total,	592	933	2,098	1,052	720	1,711	1,498	691	590	387	258	198	211

In the above table there is shown a record of typhoid fever cases by wards for thirteen years, 1901 to 1913, inclusive; for the latter year cases occurring January to October inclusive being given. It will be noted that in 1903, the greatest number of cases occurred, preceded by two years with comparatively low totals. For the next four years the totals fluctuated, but beginning with 1908 there was a continuous decrease up to 1913, in which year, for ten months, the number of cases slightly exceeded the total for the year 1912. In 1908, the Torresdale filtered water was first introduced into this section of the city and its effect is seen in the table above by the falling off of typhoid in the subsequent years. The increase in 1913 may be due partly to an unusual amount of seasonal typhoid as well as to other causes already discussed under each ward.

Water Sampling in the Torresdale High Service—Oak Lane Water District.

Torresdale High Service: The Torresdale high service water district includes the Forty-seventh Ward entire and parts of the Fifteenth, Nineteenth, Twentieth, Twenty-eighth, Twenty-ninth, Thirty-second, Thirty-seventh, and Forty-third Wards. Neither the city nor the State Health Department established sampling stations on the distributing system in this district in the Fifteenth, Nineteenth, Twenty-eighth, Twenty-ninth, and Thirty-second Wards. Both the city and the State maintained a sampling station in the Twentieth Ward, known as special sampling station No. 24 at North Tenth and Oxford Streets. In the Thirty-seventh Ward the city maintained two special sampling stations, Nos. 34 and 35, located at North Eleventh Street and Susquehanna Avenue, and North Tenth and Cumberland Streets respectively. In this ward the State had no sampling station. In the Forty-third Ward the city maintained three special sampling stations known as Nos. 36, 37, and 38, located at North Seventh Street and Lehigh Avenue, Indiana Street and Germantown Avenue, and North Sixth and Clearfield Streets respectively. The State maintained a sampling station at City special station No. 38.

The following are the results obtained by the City and the State at the various sampling stations:

ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATION NO. 21—TWENTIETH WARD—1913—DURING OCTOBER.

October.	Total Count.	B. Coli.	
		1 c. c.	10 c. c.
2,	82	—	—
6,	28	—	—
8,	21	—	+
10,	24	—	—
13,	13	—	—
20,	10	—	+

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU SPECIAL STATION NO. 24—NORTH TENTH AND OXFORD STREETS—TWENTIETH WARD—1913.

Day.	October.			November			December.		
	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.
1,	.....	.....	.....	18	0	0	12	0	0
2,	.....	.....	.....	20	0	0	14	0	0
3,	.....	.....	.....	—	—	—	10	0	0
4,	.....	.....	.....	—	—	—	11	0	0
5,	.....	.....	.....	20	0	0	56	0	0
6,	.....	.....	.....	15	0	0	32	0	0
7,	.....	.....	.....	8	0	0	—	—	—
8,	.....	.....	.....	350	0	0	8	0	0
9,	100	0	0	21	0	0	8	0	0
10,	—	—	—	140	0	0	7	0	0
11,	100	2	0	200	0	0	8	0	0
12,	—	—	—	150	0	0	16	0	0
13,	30	0	0	85	0	0	500	0	0
14,	—	—	—	60	0	0	.....	.....	.....
15,	200	0	0	39	0	0	.....	.....	.....
16,	120	1	0	28	0	0	.....	.....	.....
17,	120	2	0	40	0	0	.....	.....	.....
18,	100	0	0	14	0	0	.....	.....	.....
19,	400	0	0	19	0	0	.....	.....	.....
20,	30	0	0	8	0	0	.....	.....	.....
21,	—	—	—	14	0	0	.....	.....	.....
22,	—	—	—	26	0	0	.....	.....	.....
23,	—	—	—	12	0	0	.....	.....	.....
24,	—	—	—	12	0	0	.....	.....	.....
25,	28	0	0	16	0	0	.....	.....	.....
26,	—	—	—	36	0	0	.....	.....	.....
27,	26	0	0	—	—	—	.....	.....	.....
28,	60	0	0	20	0	0	.....	.....	.....
29,	40	0	0	45	0	0	.....	.....	.....
30,	19	0	0	16	0	0	.....	.....	.....
31,	32	0	0	.....	.....	.....	.....	.....	.....

ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NOS. 34 AND 35—THIRTY-SEVENTH WARD—1913—DURING OCTOBER.

October.	Station No. 34.			Station No. 35.		
	Total Count.	B. Coli. 1 c. c.	B. Coli. 10 c. c.	Total Count.	B. Coli. 1 c. c.	B. Coli. 10 c. c.
2,	28	—	—	56	—	—
6,	33	—	—	28	—	—
8,	10	—	+	24	—	+

ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NOS. 36, 37, AND 38, DURING OCTOBER, 1913—FORTY-THIRD WARD.

October.	Station No. 36.			Station No. 37.			Station No. 38.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	150	—	—	48	—	—	19	—	—
6,	31	—	—	24	—	—	3	—	—
8,	24	+	+	48	—	+	51	+	+
10,	25	—	—	.....	.....	.....	.....	.....	.....
13,	25	—	—	.....	.....	.....	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT WATER BUREAU SPECIAL STATION NO. 38, NORTH SIXTH AND CLEARFIELD STREETS, FORTY-THIRD WARD, 1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.
1,	.....	.....	.....	25	1	0	20	0	0
2,	.....	.....	.....	20	0	0	24	0	0
3,	.....	.....	.....	40	0	0	8	0	0
4,	.....	.....	.....	—	—	—	20	0	0
5,	.....	.....	.....	25	0	0	20	0	0
6,	.....	.....	.....	36	0	0	8	0	0
7,	.....	.....	.....	12	1	1	—	—	—
8,	.....	.....	.....	8	0	0	8	0	0
9,	.....	.....	.....	17	1	1	10	0	0
10,	80	0	0	80	0	0	6	0	0
11,	80	0	0	84	1	1	10	0	0
12,	13	0	0	90	0	0	20	0	0
13,	75	0	0	60	0	0	27	0	0
14,	80	0	0	56	0	0	.....	.....	.....
15,	80	0	0	—	—	—	.....	.....	.....
16,	—	—	—	60	0	0	.....	.....	.....
17,	100	3	1	60	1	1	.....	.....	.....
18,	80	0	0	40	0	0	.....	.....	.....
19,	20	0	0	20	0	0	.....	.....	.....
20,	80	0	0	13	0	0	.....	.....	.....
21,	60	0	0	10	0	0	.....	.....	.....
22,	12	0	0	10	0	0	.....	.....	.....
23,	22	0	0	8	0	0	.....	.....	.....
24,	18	0	0	10	0	0	.....	.....	.....
25,	8	0	0	12	0	0	.....	.....	.....
26,	—	—	—	4	0	0	.....	.....	.....
27,	22	0	0	—	—	—	.....	.....	.....
28,	45	0	0	27	0	0	.....	.....	.....
29,	20	1	0	8	0	0	.....	.....	.....
30,	45	0	0	10	0	0	.....	.....	.....
31,	24	0	0	.....	.....	.....	.....	.....	.....

The water supplied to the Torresdale high service district, the character of which has been shown in the above tables is ordinarily obtained direct from Lardner's Point pumping station through a forty-eight inch main. The results show that this water is of a better quality bacteriologically than that obtained in the central and South Philadelphia districts. The water is obtained from the same conduit that brings water from the Torresdale filter plant to Lardner's Point pumping station for the rest of the Torresdale district. The results of samples from the terminal of this conduit and taps at the pumping station shows the water delivered to the whole of the Torresdale district to be the same as it leaves the pumping station. The change that occurs between the pumping station and the central and southern districts does not appear between the pumping station and the high service district. The results for October do not show the presence of B. Coli as in the central and southern district. There is not the evidence of sediment in the distributing system. From the forty-eight inch main coming from Lardner's Point there is near North Sixth and Ontario Streets a main of equal size going to the Oak Lane reservoir which acts as an equalizer and storage basin. It is also possible to obtain water from this district for the Corinthian reservoir, a comparatively small equalizing basin, in the Fifteenth Ward, along Poplar Street between Corinthian and North Twenty-second Streets. It is understood that the supply to the Corinthian reservoir is to augment the low service and that no water from Corinthian reservoir returns to the high service district. Entering the high service district is a thirty inch main from Wentz farm reservoir and a small portion of the high service district receives water from this source. This reservoir is supplied direct from Lardner's Point and the water is similar to that from the forty-eight inch main, although at times showing the effect of passing through a reservoir.

Results of samples obtained by the State from the Oak Lane reservoir are shown in the following table:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT THE OAK LANE RESERVOIR.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.
1,	.....	.....	.....	33	0	0	18	0	0
2,	.....	.....	.....	46	0	0	8	0	0
3,	.....	.....	.....	48	0	0	48	0	0
4,	.....	.....	.....	—	—	—	50	0	0
5,	.....	.....	.....	60	0	0	24	0	0
6,	.....	.....	.....	32	0	0	10	0	0
7,	.....	.....	.....	5	0	0	—	—	—
8,	.....	.....	.....	5	0	0	12	0	0
9,	.....	.....	.....	—	—	—	27	0	0
10,	.....	.....	.....	56	0	0	11	0	0
11,	.....	.....	.....	16	0	0	6	0	0
12,	.....	.....	.....	15	0	0	11	0	0
13,	.....	.....	.....	24	0	0	13	0	0
14,	.....	.....	.....	70	0	0	.....	.....	.....
15,	.....	.....	.....	24	0	0	.....	.....	.....
16,	.....	.....	.....	—	—	—	.....	.....	.....
17,	.....	.....	.....	44	0	0	.....	.....	.....
18,	.....	.....	.....	20	0	0	.....	.....	.....
19,	.....	.....	.....	6	0	0	.....	.....	.....
20,	.....	.....	.....	10	0	0	.....	.....	.....
21,	.....	.....	.....	8	0	0	.....	.....	.....
22,	.....	.....	.....	17	0	0	.....	.....	.....
23,	.....	.....	.....	5	0	0	.....	.....	.....
24,	.....	.....	.....	6	0	0	.....	.....	.....
25,	.....	.....	.....	11	0	0	.....	.....	.....
26,	80	1	0	8	0	0	.....	.....	.....
27,	21	0	0	.....	.....	.....	.....	.....	.....
28,	22	0	0	25	0	0	.....	.....	.....
29,	60	0	0	40	0	0	.....	.....	.....
30,	100	0	0	36	0	0	.....	.....	.....
31,	40	0	0	.....	.....	.....	.....	.....	.....

The above results show the water in Oak Lane reservoir to be similar to that obtained from the distributing system in the high service district. The total count is a little lower than that obtained from city special station No. 24, but there is the same absence of Pink and B. Coli Colonies.

In the following tables are shown the results of analyses obtained by the city and by the State at the Corinthian reservoir which is located in the high service district and receives a part of the supply from the high service system. The State results are given first:

CORINTHIAN RESERVOIR BACTERIAL COUNTS AND B. COLI DETERMINATIONS.—STATE HEALTH DEPARTMENT RESULTS—OCTOBER 24TH TO DECEMBER 13TH, 1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.	Total Count.	Pink Col.	B.Coli. 1 c. c.
1,	.....	.....	.....	120	0	0	80	0	0
2,	.....	.....	.....	56	—	0	40	0	0
3,	.....	.....	.....	48	—	0	100	0	0
4,	.....	.....	.....	—	—	—	40	0	0
5,	.....	.....	.....	71	—	1	24	0	0
6,	.....	.....	.....	60	—	0	12	0	0
7,	.....	.....	.....	45	—	0	—	—	—
8,	.....	.....	.....	—	—	—	13	0	0
9,	.....	.....	.....	250	0	0	15	0	0
10,	.....	.....	.....	70	1	1	18	0	0
11,	.....	.....	.....	140	0	0	40	0	0
12,	.....	.....	.....	—	—	—	31	0	0
13,	.....	.....	.....	90	0	0	8	0	0
14,	.....	.....	.....	60	0	0	.....	.....	.....
15,	.....	.....	.....	120	0	0	.....	.....	.....
16,	.....	.....	.....	45	0	0	.....	.....	.....
17,	.....	.....	.....	48	0	0	.....	.....	.....
18,	.....	.....	.....	24	1	0	.....	.....	.....
19,	.....	.....	.....	8	0	0	.....	.....	.....
20,	.....	.....	.....	11	0	0	.....	.....	.....
21,	.....	.....	.....	19	0	0	.....	.....	.....
22,	.....	.....	.....	21	0	0	.....	.....	.....
23,	.....	.....	.....	100	0	0	.....	.....	.....
24,	80	0	0	31	0	0	.....	.....	.....
25,	50	9	6	100	0	0	.....	.....	.....
26,	150	1	0	15	0	0	.....	.....	.....
27,	150	0	0	—	—	—	.....	.....	.....
28,	300	0	0	28	0	0	.....	.....	.....
29,	60	0	0	150	0	0	.....	.....	.....
30,	140	0	0	250	0	0	.....	.....	.....
31,	250	0	0	.....	.....	.....	.....	.....	.....

The above table and the one next following, representing the Corinthian reservoir water, show a water containing more bacteria to the cubic centimeter and more B. Coli to the cubic centimeter than were found in the high service distributing system or Oak Lane reservoir. The results are similar to those obtained in the central and southern districts. It is known that there is a large amount of sediment in this reservoir and that the water level fluctuates rapidly causing a disturbance in this sediment. This disturbance and fluctuation in the reservoir may help to explain the higher count and the presence of B. Coli. It is also probable that sediment from the low district distributing system is frequently carried into the reservoir and affects the results. The agitation of the water in the low service distributing system caused by flushing the mains during October, 1913, would affect this reservoir and the results indicate such an action and are such as would be expected in an equalizing reservoir on the low service distributing system. The results, however, are liable, to be affected by water from the Schuylkill District which at times is allowed to enter this reservoir. The results obtained by the city at this reservoir follow:

CORINTHIAN RESERVOIR BACTERIAL COUNTS AND B. COLI DETERMINATIONS, CITY RESULTS—JUNE TO DECEMBER, 1913.

Day.	June.			July.			August.			September.			October.			November.			December.		
	Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1.	.....	.....	.....	.....	.....	.....	180	+	+	.....	.....	.....	210	—	+	.....	.....	.....	34	—	—
2.	.....	.....	.....	130	+	+	.....	.....	.....	190	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
3.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	140	—	+	65	—	+	23	—	—
4.	.....	.....	.....	.....	.....	.....	84	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5.	.....	.....	.....	.....	.....	.....	.....	.....	.....	36	—	+	.....	.....	.....	44	—	—	14	—	—
6.	.....	.....	.....	.....	.....	.....	150	—	—	.....	.....	.....	240	—	+	.....	.....	.....	.....	.....	.....
7.	.....	.....	.....	460	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	42	—	+	.....	.....	.....
8.	.....	.....	.....	.....	.....	.....	160	—	—	46	+	+	210	—	+	.....	.....	.....	46	—	—
9.	.....	.....	.....	520	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10.	.....	.....	.....	.....	.....	.....	.....	.....	.....	79	—	+	74	—	+	73	—	+	77	—	—
11.	.....	.....	.....	150	—	+	260	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12.	.....	.....	.....	.....	.....	.....	.....	.....	.....	240	—	—	.....	.....	.....	32	—	—	64	—	—
13.	.....	920	+	+	.....	.....	300	+	+	.....	.....	.....	.....	.....	.....	56	.....	.....	.....	.....	.....
14.	.....	.....	.....	29	—	+	.....	.....	.....	200	—	+	140	+	+	.....	.....	.....	56	—	—
15.	.....	.....	.....	.....	.....	.....	280	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16.	580	+	+	37	—	+	.....	.....	.....	46	—	+	94	—	+	35	—	—	26	—	—
17.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18.	240	—	+	94	+	+	140	+	+	94	—	+	.....	.....	.....	50	—	—	15	—	—
19.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	94	—	+	.....	.....	.....	.....	.....	.....
20.	2,200	—	+	.....	.....	.....	300	—	+	.....	.....	.....	.....	.....	.....	42	—	+	.....	.....	.....
21.	.....	.....	.....	84	—	+	.....	.....	.....	140	—	+	51	+	+	.....	.....	.....	36	—	—
22.	.....	.....	.....	.....	.....	.....	250	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23.	460	—	+	140	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24.	.....	.....	.....	.....	.....	.....	.....	.....	.....	78	—	+	80	—	—	30	—	+	42	—	—
25.	140	—	+	99	—	—	290	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26.	.....	.....	.....	.....	.....	.....	.....	.....	.....	70	—	—	.....	.....	.....	46	—	—	48	—	—
27.	130	+	+	.....	.....	.....	66	+	+	.....	.....	.....	48	—	—	.....	.....	.....	.....	.....	.....
28.	.....	.....	.....	120	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	52	—	—	.....	.....	.....
29.	.....	.....	.....	.....	.....	.....	180	—	+	120	—	—	52	—	+	.....	.....	.....	36	—	—
30.	99	—	+	70	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
31.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	120	—	+	.....	.....	.....	82	—	—

CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICT.

The Central and South Philadelphia Water District comprises that section of the city lying between the two rivers from Vine Street south to League Island, a distance of four miles and a half. It is subdivided into two districts, the upper being termed the "Central District" and made up of wards Five, Six, Seven, Eight, Nine, and Ten. This section is the old portion of the city and extends southerly from Vine Street on the north to South Street, a distance of one mile. The distance between the two rivers in this district is two miles and in the area there is a population of approximately 90,000 persons. It is congested and comprises the great shopping district as well as the downtown business section. Along the southern edge of this Central District is found a more exclusively residential section.

The remainder of the territory extending from South Street to League Island is known as the "South Philadelphia District." It comprises wards One, Two, Three, Four, Twenty-six, Thirty, Thirty-six, and Thirty-nine and has a total population of 340,000 or eighty per cent. of the entire population south of Vine street. The section covers an area of approximately nine square miles but the closely built up districts extend south only as far as Oregon Avenue, about two miles and a half south of City Hall. Below this line the city territory is largely open land given over to some extent to truck farming with a considerable portion unimproved, the land being marshy and of necessity requiring to be drained before it can be utilized. In this particular section are found many of the poudrette pits used by the night soilers of the city and also the piggeries, the present cause of considerable agitation because of alleged nuisances arising therefrom. The South Philadelphia section has an average width between the two rivers of three and a half miles and the lower portion of the district is locally known as "The Neck."

The Central and South Philadelphia water district is supplied with fresh Lardner's Point water through two express mains, one of which enters the district on Second Street and terminates at Market Street. This is forty-eight inches in diameter. The other express main comes down Broad Street, passes through the Central District into the South Philadelphia District and terminates at McKean Street. Here a connection is made with a twenty inch main paralleling the forty-eight inch main and this extends south as far as Oregon Avenue from which point a twelve inch main continues south on Broad Street to the League Island Navy Yard. The extreme southeastern section of the city lying south of Oregon Avenue and east of Broad Street does not have a public water supply. On the west side of Broad Street south of Oregon Avenue there is one main extending into the district. This is laid in Penrose Ferry Road, and twelve inches in diameter, terminating at a point near the Schuylkill River. The South Philadelphia District differs from the Central District in that it is almost wholly residential. There are, however, numerous small industries in this district.

In the district under discussion dual pipe connections were found, sediment in the mains is extensive and tests of this mud show it to contain abundant bacterial life and the sewage organisms. For the year 1913, there were 675 cases of typhoid fever, from January to October inclusive, in the entire district, of which number 107 cases were located in the Central District and 568 cases in the South Philadelphia District.

The citizens of Philadelphia first get filtered Torresdale water in the Frankford and Wentz Farm Reservoir Water District; next it is served in the Kensington District; then in the Torresdale High Service Oaklane District; and finally in the Central and South Philadelphia Water District. For all practical purposes this latter district is on the direct pumping system from Lardner's Point Station. The Corinthian Reservoir, located in the Fifteenth Ward in the vicinity of Girard College, acts as an equalizer.

In the following table are given data concerning the extent, population, and typhoid fever in the Central and South Philadelphia Water District. The wards given below are entirely within the district:

CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICT DATA.

Wards.	Population in Water District.	Cases of Typhoid Fever.		
		1911. Entire Year.	1912. Entire Year.	1913. Jan.-Oct., Inc.
CENTRAL.				
5th Ward,	17,000	16	21	33
6th Ward,	6,400	6	10	9
7th Ward,	27,000	18	28	36
8th Ward,	14,000	15	18	10
9th Ward,	5,000	2	2	4
10th Ward,	19,000	11	23	15
Total Sub. Dist,	88,400	68	102	107
SOUTH PHILADELPHIA.				
1st Ward,	48,000	26	51	80
2nd Ward,	40,000	40	66	76
3rd Ward,	26,000	20	29	45
4th Ward,	22,000	27	28	32
26th Ward,	55,000	43	55	117
30th Ward,	29,000	21	9	17
36th Ward,	61,000	21	63	84
39th Ward,	54,000	31	44	117
Total Sub. Dist.,	335,000	229	345	568
Grand total for district,	423,400	297	447	675

From the above it is to be noted that, for the first ten months, there is for the year 1913 a record of more cases of typhoid fever in both the Central and South Philadelphia subdistricts than for the years 1911 and 1912. This was likewise true for the Kensington Water District but the reverse was true for the Wentz Farm Reservoir District. Each of the wards comprised in the Central and South Philadelphia Water Districts will be taken up and studied individually.

CENTRAL WATER DISTRICT.

Fifth Ward: The Fifth Ward is a river ward and extends west to Seventh Street. North and south it is bounded by Chestnut and South Streets respectively. It is a congested district.

In the Fifth Ward the city maintains two regular sampling stations. These stations are No. 19, located at the corner of Delaware Avenue and Walnut Streets in the northeastern part, and No. 20 located at 513 South Street in the southwestern part of the ward. The city also established special stations, No. 77 at the Dock Street fish markets and No. 78 at Pine and Second Streets. The State Health Department had no sampling station in this ward, but collected muddy water samples from a fire hydrant here.

The results obtained at city sampling station Nos. 19 and 20 are as follows:

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY STATION NO. 19 DURING 1913.

Day.	June.			July.			August.			September.		
	Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1,	.....	.....	.....	.....	.....	.....	62	+	+	.....	.....	.....
2,	.....	.....	.....	220	—	—	.....	.....	.....	140	—	+
3,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4,	.....	.....	.....	.....	.....	.....	26	—	—	160	—	+
5,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6,	.....	.....	.....	.....	.....	.....	110	—	+	.....	.....	.....
7,	.....	.....	.....	25	—	—	.....	.....	.....	.....	.....	.....
8,	.....	.....	.....	.....	.....	.....	12	—	—	.....	.....	.....
9,	21	—	+	24	—	+	.....	.....	.....	21	+	+
10,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11,	19	—	—	8	—	+	12	—	—	17	+	+
12,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13,	22	—	—	.....	.....	.....	55	—	+	.....	.....	.....
14,	.....	.....	.....	17	—	—	.....	.....	.....	.....	.....	.....
15,	.....	.....	.....	.....	.....	.....	310	—	+	.....	.....	.....
16,	45	—	+	290	—	+	.....	.....	.....	156	—	+
17,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18,	.....	.....	.....	150	—	+	.....	.....	.....	56	+	+
19,	420	+	+	.....	.....	.....	240	—	—	.....	.....	.....
20,	900	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
21,	.....	.....	.....	150	—	+	120	—	—	.....	.....	.....
22,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23,	80	—	+	98	—	—	.....	.....	.....	34	—	—
24,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25,	40	+	+	20	—	+	.....	.....	.....	63	—	+
26,	.....	.....	.....	.....	.....	.....	14	—	+	.....	.....	.....
27,	210	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
28,	.....	.....	.....	110	—	—	46	—	—	.....	.....	.....
29,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30,	70	—	+	45	—	+	.....	.....	.....	.....	.....	.....
31,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY STATION NO. 20 DURING 1913.

Day	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c.c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1,							70	+	+						
2,				30	—	—				22	—	+	180	+	+
3,															
4,							15	+	+	75	—	+			
5,															
6,							220	+	+				87	—	+
7,				34	—	+									
8,							24	—	—				210	—	+
9,				45	+	+				37	+	+			
10,													90	—	+
11,	38	—	—	22	—	+	19	—	—	21	+	—			
12,															
13,	27	—	+				68	—	+				140	—	+
14,															
15,							200	+	+				64	—	+
16,	48	—	+	85	—	+				63	—	—			
17,													64	+	+
18,				34	—	+				84	—	+			
19,	76	—	+				96	—	+						
20,	200	+	+										31	—	+
21,				21	—	+	73	—	—				73	—	+
22,															
23,	80	—	+	39	—	—				65	—	—			
24,															
25,	41	—	+	8	—	—				78	—	—			
26,							27	—	+						
27,	13	—	—												
28,				22	—	—	13	—	+				43	—	+
29,															
30,	31	—	—	29	—	—				17	—	—	54	—	+
31,															

At station No. 19 during June, the highest total count occurred on Friday. During July the highest total counts were evenly divided between Monday and Wednesday. In August the highest total count occurred once on Monday, twice on Wednesday and twice on Friday. During September, the highest count occurred twice on Monday and twice on Wednesday.

At station No. 20, during June, the highest total count occurred once each on Monday, Wednesday, and Friday. During July the highest total counts occurred three times on Wednesday. During August the highest counts were on Monday once, Wednesday twice, and Friday twice. In September the highest counts were on Monday once and Wednesday three times, while in October the highest count occurred on Monday once and on Wednesday four times.

SUMMARY OF RESULTS OF ANALYSES OF CITY SAMPLES AT STATION NO. 19, 1913.

	June.	July.	August.	September.
Number of samples analyzed,	10	12	11	8
Average count,	182	88	92	.....
Maximum count,	900	290	310	.....
Minimum count,	19	8	12	.....
Number of tests for B. Coli,	10	12	11	8
Times positive in 1 c. c.,	3	0	1	3
Times positive in 10 c. c.,	7	7	5	7

SUMMARY OF RESULTS OF ANALYSES OF SAMPLES AT CITY STATION NO. 20.

	June.	July.	August.	September.	October.
No. of samples analyzed,	9	11	11	9	11
Average count,	62	34	75	51	94
Maximum count,	200	85	200	84	210
Minimum count,	13	8	13	17	31
Number of tests for B. Coli,	9	12	11	9	11
Times positive in 1 c. c.,	1	1	4	2	2
Times positive in 10 c. c.,	6	7	7	4	11

The total count at Station No. 19 shows a higher average than at Station No. 20. In each of the three months for which a maximum count is shown at Station No. 19, the count is considerably larger than at Station No. 20. The B. Coli results, however, are similar at the two stations.

ANALYSES OF CITY WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NO. 77 AND NO. 78 DURING OCTOBER, 1913.

October.	Station No. 77.			Station No. 78.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	88	+	+	74	+	+
6,	140	+	+	26	−	−
8,	95	−	+	110	−	+
10,	160	+	+	45	−	−
13,	110	−	+	210	−	+
15,	180	+	+	74	−	+
17,	150	+	+	160	+	+
20,	68	−	+	77	−	+

The State Department of Health conducted a series of tests of muddy water samples collected from a fire hydrant in the Fifth Ward at the corner of Locust and South Fifth Streets. The results are given in the following table:

SERIES OF MUDDY WATER TESTS BY THE STATE AT FIRE HYDRANT AT LOCUST AND SOUTH FIFTH STREETS, FIFTH WARD—OCTOBER 14, 1913.

Sample.	Hour of Collection.	Bacteria per C. C.		
		Total.	Pink Colonies.	B. Coli.
No. 1 Saloon, Cor. 5th and Locust Sts., ...	11.25 A. M., ...	80	1	0
No. 2 Fire Hydrant, ..	11.30 A. M., ...	1,200	3	2
No. 3 Fire Hydrant, ..	1.40 P. M., ...	1,500	4	2
No. 4 Fire Hydrant, ..	1.45 P. M., ...	2,500	6	4
No. 5 Fire Hydrant, ..	2.50 P. M., ...	1,200	3	0
No. 6 Fire Hydrant, ..	4.00 P. M., ...	900	3	0

Before operating any valves in this neighborhood, sample No. 1 was collected. After collecting sample No. 1 the valve on the water main just beyond the fire plug was closed, thus making the fire plug act as a blow-off on a dead end. The fire hydrant was then opened quickly and the sample collected almost immediately after the water began to flow, this sample being No. 2. The water appeared very turbid. After the hydrant had been opened three minutes it was closed until 1.40 P. M. When opened at that time sample No. 3 was collected after two minutes' flow. The water appeared to increase in turbidity as the flow continued. At 1.45 P. M. the flow appeared very muddy and thick; at this time sample No. 4 was collected. A man was stationed at this hydrant and the flow was continued until 2.50 P. M., when sample No. 5 was collected. At this time the water looked clear, but when the hydrant was open to its fullest extent more mud appeared. The water continued to flow until 4 P. M. when sample No. 6 was collected. After the collection of this sample the hydrant was opened to its fuliest capacity and a small amount of mud appeared. From the results it is believed that little if any mud was collected in samples Nos. 1, 5, and 6. Samples Nos. 3 and 4 contained a large proportion of mud and the results are probably characteristic of the mud in the mains in this ward.

Typhoid fever cases in the Fifth Ward occurred in the last six years as shown in the table following. It will be noted from a study of this table that there was no marked decrease in typhoid cases until the prefilters were put into service in March, 1909. In the following year there was a slight increase over 1909. The introduction of hypochlorite of lime was accompanied by a slight decrease in cases but the number of cases again rose in 1913.

Of the thirty-three cases occurring in the year 1913, three may be charged to the drinking of raw river water, five were imported from outside the city, and six are thought to have been contacts either at work or at home. Thus fourteen of the cases are accounted for, leaving nineteen cases of unknown origin. An interesting feature is the location of the cases, all of them living in the lower half of the ward. This may possibly be accounted for by the fact that the northern part of the ward is largely given over to business purposes. There are one or two groups of cases but the great majority are scattered.

TYPHOID FEVER CASES IN THE FIFTH WARD FOR SIX YEARS. POPULATION 17,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January, ...	8	4	3	1 Lime.	0 Lime.	1 Lime.
February, ...	7	3	4	0 Lime.	1 Lime.	1
March, ...	7	3 PF.	3	1 Lime.	1 Lime.	4
April, ...	6	0	0	2 Lime.	0 Lime.	2
May, ...	1 F.	0	1	1	1 Lime.	2
June, ...	1	0	1	2	1 Lime.	0
July, ...	4	1	2	1	3 Lime.	1
August, ...	0	4	3	2	5 Lime.	4
September, ...	1	3	3	3	5 Lime.	4
October, ...	4	1	5	1	3 Lime.	4
November, ...	1	1	2	2	0 Lime.	.....
December, ...	0	1	3 Lime.	0 Lime.	1 Lime.	.....
Total, ...	50	21	30	16	21	33

Typhoid Fever Cases in the Fifth Ward For Six Years—Open Season April to October, Inclusive.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	27	9	15	12	18	27

Sixth Ward: In the Sixth Ward the city maintains regular sampling stations No. 17 and No. 18, the former was established in May, 1913, and the latter in June, 1913. During October, 1913, special stations No. 74 and 76 were established by the city. The State Health Department had sampling stations at 530 Arch Street, which is the same as city regular station No. 17; at the Market Street ferries, which is the same as city regular station No. 18; and muddy water samples were collected at a fire hydrant on Florist Street between South Third and South Fourth Streets.

The following are the results obtained at city regular sampling station No. 17 and 18.

RESULT OF ANALYSES OF WATER SAMPLES FROM CITY REGULAR STATION NO. 17—1913.

Day.	May.			June.			July.			August.			September.			October.		
	Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.		Total count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1,	.....	.....	.....	.....	.....	.....	.....	.....	.....	62	—	+	.....	.....	.....	.....	.....	.....
2,	.....	.....	.....	67	—	+	62	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
3,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	260	+	+	.....	.....	.....
4,	.....	.....	.....	940	+	+	.....	.....	.....	22	—	—	.....	.....	.....	.....	.....	.....
5,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	180	+	+	.....	.....	.....
6,	.....	.....	.....	700	+	+	.....	.....	.....	280	+	+	.....	.....	.....	.....	.....	.....
7,	.....	.....	.....	.....	.....	.....	16	+	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
8,	.....	.....	.....	.....	.....	.....	.....	.....	.....	80	—	+	38	—	—	.....	.....	.....
9,	.....	.....	.....	32	—	+	45	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
10,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	—	+	.....	.....	.....
11,	.....	.....	.....	15	—	—	6	—	—	5	—	—	.....	.....	.....	.....	.....	.....
12,	14	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	41	+	+	.....	.....	.....
13,	.....	.....	.....	26	—	+	.....	.....	.....	90	—	—	.....	.....	.....	.....	.....	.....
14,	61	—	—	.....	.....	.....	10	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
15,	.....	.....	.....	.....	.....	.....	.....	.....	.....	170	+	+	7	—	—	.....	.....	.....
16,	110	—	+	55	—	—	120	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
17,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35	—	—	.....	.....	.....
18,	.....	.....	.....	.....	.....	.....	82	+	+	14	—	—	.....	.....	.....	.....	.....	.....
19,	330	+	+	180	—	+	.....	.....	.....	.....	.....	.....	760	—	—	.....	.....	.....
20,	.....	.....	.....	700	—	+	.....	.....	.....	160	—	+	.....	.....	.....	.....	.....	.....
21,	530	+	+	.....	.....	.....	68	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
22,	.....	.....	.....	.....	.....	.....	.....	.....	.....	310	+	+	49	—	+	160	+	+
23,	62	—	+	36	—	+	160	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
24,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	—	—	.....	.....	.....
25,	.....	.....	.....	72	+	+	28	—	+	60	—	+	.....	.....	.....	.....	.....	.....
26,	9	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	21	—	+	.....	.....	.....
27,	.....	.....	.....	18	—	—	.....	.....	.....	95	—	—	.....	.....	.....	.....	.....	.....
28,	17	—	+	.....	.....	.....	14	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
29,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39	—	+
30,	.....	.....	.....	14	—	+	47	—	—	42	—	—	.....	.....	.....	.....	.....	.....
31,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	110	—	—	28	—	+

RESULTS OF ANALYSES OF WATER SAMPLES FROM CITY REGULAR STATION NO. 18—1913.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coll.		Total Count.	B. Coll.		Total Count.	B. Coll.		Total Count.	B. Coll.		Total Count.	B. Coll.	
		1 c. c.	10 c. c.		1 c. c.	10 c.c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1	.....	.....	.....	.....	.....	.....	86	—	+	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	52	—	+	.....	.....	.....	9	—	—	.....	.....	.....
3	.....	.....	.....	.....	.....	.....	16	—	—	210	+	+	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	130	—	—	.....	.....	.....	.....	.....	.....
5	.....	.....	.....	38	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	23	—	—	.....	.....	.....	.....	.....	.....
7	15	—	—	27	—	+	.....	.....	.....	25	+	+	.....	.....	.....
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	56	—	+	16	—	—	2	—	—	31	+	+	.....	.....	.....
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	41	—	—	.....	.....	.....	13	—	—	.....	.....	.....	.....	.....	.....
12	.....	.....	.....	18	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	.....	.....	.....	20	—	—	.....	.....	.....	.....	.....	.....
14	10	—	—	81	—	—	.....	.....	.....	140	+	+	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16	.....	.....	.....	53	—	—	.....	.....	.....	110	+	+	.....	.....	.....
17	16	—	—	.....	.....	.....	5	—	—	.....	.....	.....	.....	.....	.....
18	700	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19	.....	.....	.....	15	—	—	16	—	—	.....	.....	.....	.....	.....	.....
20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	—	+
21	35	—	—	46	—	—	.....	.....	.....	21	+	+	.....	.....	.....
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	36	—	—	11	—	—	.....	.....	.....	91	+	+	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	5	—	—	.....	.....	.....	.....	.....	.....
25	110	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	.....	.....	.....	14	—	—	13	—	+	.....	.....	.....	16	+	+
27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	160	—	+	160	+	+	.....	.....	.....	170	—	—	23	—	—
29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

At Station No. 17, during May, the highest total count occurred twice on Wednesday and twice on Friday; during June, once on Monday and Friday, and twice on Wednesday; during July four times on Wednesday; during August, once on Monday, and twice on Wednesday and Friday, and during September, once on Monday and Wednesday, and twice on Friday.

At Station No. 18, the highest total count occurred once Wednesday and twice on Friday; during July, twice on Monday, three times on Wednesday; in August, twice on Wednesday, once on Friday; and in September once on Monday, Wednesday, and Friday.

SUMMARY OF RESULTS OF ANALYSES OF SAMPLES AT CITY STATION NO. 17.

	May.	June.	July.	Aug.	Sept.	Oct.
Number of samples analyzed,	8	13	12	13	12	3
Average count,	142	220	55	107	133	76
Maximum count,	530	940	166	310	760	160
Minimum count,	9	14	6	5	7	28
Number of tests for B. Coli,	8	13	12	13	12	3
Times positive in 1 c. c.,	2	3	4	3	3	1
Times positive in 10 c. c.,	5	10	5	7	6	3

SUMMARY OF RESULTS OF ANALYSES OF SAMPLES AT CITY STATION NO. 18.

	June.	July.	Aug.	Sept.	Oct.
Number of samples analyzed,	10	12	11	9	3
Average count,	112	40	29	90	28
Maximum count,	700	110	130	140	46
Minimum count,	10	11	2	9	16
Number of tests for B. Coli,	10	12	11	9	3
Times positive in 1 c. c.,	0	1	0	7	1
Times positive in 10 c. c.,	3	4	2	7	2

The average and total count at Station No. 17 appears considerably higher than at Station No. 18. Also B. Coli are more frequently present in one cubic centimeter at Station No. 17. Water at Station No. 17 is obtained from a thirty inch main fed from the forty-eight inch main terminating at Market Street. This should be water delivered fresh from Lardner's Point pumping station. There is little probability that mud in the pipes in this section could affect the results although the course of the water at this point was not accurately determined. It is possible, however, that dual connections in this vicinity, to be described later, may have affected the sampling station.

ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NO. 74 AND NO. 76 DURING OCTOBER, 1913.

October.	Station No. 74.			Station No. 76.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	170	+	+	39	−	+
6,	63	−	+	100	+	+
8,	110	−	+	120	+	+
10,	33	+	+	35	−	+
13,	55	−	+	26	−	+
15,	120	−	+	43	−	+
17,	110	−	+	130	+	+
20,	22	−	−	21	−	−

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION NO. 17—330 ARCH STREET—SIXTH WARD—1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	16	0	0	45	0	0
2,	.....	.....	.....	.....	.....	.....	48	0	0
3,	.....	.....	.....	.....	.....	.....	24	0	0
4,	.....	.....	.....	.....	.....	.....	12	0	0
5,	.....	.....	.....	30	0	0	24	0	0
6,	.....	.....	.....	23	0	0	28	0	0
7,	.....	.....	.....	18	0	0	.....	.....	.....
8,	600	0	0	40	0	0	17	0	0
9,	1,200	4	0	100	0	0	14	0	0
10,	380	3	1	150	0	0	20	0	0
11,	220	1	0	36	0	0	8	0	0
12,	560	2	1	60	0	0	10	0	0
13,	50	0	0	41	1	1	22	0	0
14,	.....	.....	.....	30	0	0	.....	.....	.....
15,	400	4	3	29	0	0	.....	.....	.....
16,	2,400	0	0	32	0	0	.....	.....	.....
17,	900	4	2	56	1	1	.....	.....	.....
18,	1,200	6	4	16	0	0	.....	.....	.....
19,	900	4	3	24	0	0	.....	.....	.....
20,	100	0	0	12	0	0	.....	.....	.....
21,	.....	.....	.....	16	0	0	.....	.....	.....
22,	.....	.....	.....	17	1	0	.....	.....	.....
23,	.....	.....	.....	16	0	0	.....	.....	.....
24,	450	2	1	16	0	0	.....	.....	.....
25,	45	1	0	14	0	0	.....	.....	.....
26,	.....	.....	.....	12	0	0	.....	.....	.....
27,	75	6	6	.....	.....	.....	.....	.....	.....
28,	52	0	0	15	0	0	.....	.....	.....
29,	90	0	0	48	0	0	.....	.....	.....
30,	20	0	0	18	0	0	.....	.....	.....
31,	40	0	0	.....	.....	.....	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT WATER BUREAU STATION NO. 18 AT MARKET STREET FERRIES—SIXTH WARD—1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	24	0	0	80	0	0
2,	.....	.....	.....	72	0	0	60	0	0
3,	.....	.....	.....	350	0	0	300	0	0
4,	.....	.....	.....	.....	.....	.....	300	0	0
5,	.....	.....	.....	40	0	0	900	2	2
6,	.....	.....	.....	10	0	0	140	0	0
7,	.....	.....	.....	250	0	0	.....	.....	.....
8,	.....	.....	.....	23	0	0	100	1	0
9,	.....	.....	.....	175	1	1	9	0	0
10,	200	0	0	160	0	0	16	0	0
11,	120	0	0	45	0	0	12	0	0
12,	80	3	1	60	0	0	10	0	0
13,	150	0	0	73	0	0	6	0	0
14,	.....	.....	.....	60	0	0	.....	.....	.....
15,	150	2	1	58	0	0	.....	.....	.....
16,	1,000	0	0	48	0	0	.....	.....	.....
17,	650	3	3	16	0	0	.....	.....	.....
18,	500	5	2	30	0	0	.....	.....	.....
19,	550	1	1	40	0	0	.....	.....	.....
20,	1,200	0	0	25	0	0	.....	.....	.....
21,	130	0	0	29	0	0	.....	.....	.....
22,	54	0	0	24	0	0	.....	.....	.....
23,	50	0	0	60	1	1	.....	.....	.....
24,	9	1	1	14	0	0	.....	.....	.....
25,	.....	.....	.....	5	0	0	.....	.....	.....
26,	.....	.....	.....	16	0	0	.....	.....	.....
27,	23	0	0	.....	.....	.....	.....	.....	.....
28,	400	0	0	70	0	0	.....	.....	.....
29,	120	0	0	900	0	0	.....	.....	.....
30,	30	0	0	350	0	0	.....	.....	.....
31,	28	0	0	.....	.....	.....	.....	.....	.....

As previously stated the results obtained by the city at Station No. 17 show a higher total count and B. Coli are found more frequently than at Station No. 18, but the results obtained by the State as shown in the above two tables do not indicate this difference. In this connection, however, it should be noted that the samples collected by the State began in October and those collected by the city ended in October, so that the series given by the State is rather a continuation of the series started by the city.

The two tables just given show the results at 530 Arch Street and the Market Street Ferries to be similar. At both stations the total count was higher during October than in December and November, and B. Coli appeared more frequently. At 530 Arch Street, nineteen samples tested for B. Coli during October showed its presence in eight samples. During November two samples out of twenty-six showed the presence of B. Coli and in December no coli were found in twelve samples. At the Market Street Ferries during October, B. Coli were present in six out of nineteen samples; during November in two out of twenty-eight, and in December, in one out of twelve. Taking the samples collected by the State as a continuation of the series started by the city, it will be noticed that there was a gradual improvement in the water beginning in October. This improvement may be the result of a systematic flushing of mains by the city causing the removal of a great deal of mud and especially that which would probably be most easily affected by changing of flow in the main.

On October 14th, 1913, the State took a series of muddy water samples at a fire hydrant on Florist Street between South Third and South Fourth Streets and almost directly opposite the fire station. It is said that this hydrant is frequently used by the fireman in testing hose. In the following table are the results obtained from these samples:

SERIES OF MUDDY WATER TESTS BY THE STATE AT FIRE HYDRANT ON FLORIST STREET BETWEEN SOUTH THIRD AND SOUTH FOURTH STREETS—SIXTH WARD—OCTOBER 14TH, 1913.

Sample.	Hour of Collection.	Bacteria Per C. C.		
		Total Count.	Pink Colonies.	B. Coli.
No. 1 tap, at fire house opposite,	11:35 A. M.	100	2	1
No. 2 fire hydrant,	11:40 A. M.	1,500	6	4
No. 3 fire hydrant,	2:00 P. M.	1,000	3	0
No. 4 fire hydrant,	3:00 P. M.	250	4	1
No. 5 fire hydrant,	3:50 P. M.	140	1	1

The water obtained at this hydrant was clear throughout the test. The hydrant was opened quickly to its full extent and then closed and opened again to see if there was a deposit in the main that could be disturbed. This hydrant was operated as a blow off on a dead end as was done in each case when collecting muddy water samples. It is probable that the firemen had used this hydrant frequently and had in this way removed any deposit in the immediate vicinity. It will be noted that the sample collected at the fire station showed a low total count and the presence of one B. Coli. Throughout the test the total counts remained low and but few B. Coli were obtained. The persistence of B. Coli in the samples is probably due to the fact that this hydrant was not allowed to run for any length of time as there was no man available to be stationed at this point. It should also be borne in mind that the supply in this section is undoubtedly from the thirty inch main direct from the terminal of the forty-eight inch main bringing water to this district direct from Lardner's Point pumping station.

Dual Pipe Connections in the Sixth Ward.

There were only two dual pipe connections in this ward. One at the Market Street Ferry Slips of the Pennsylvania Railroad Company and the other at the municipal high pressure fire pumping station at Delaware Avenue and Arch Street. At the former the city maintains a regular sampling station—No. 18—established June, 1913, this also being used by the State. There is no station at the high pressure pumping station but the city has maintained sampling Stations No. 17 at 530 Arch Street since May, 1913, and this was also used by the State.

The Market Street Ferry Slips are owned and operated by the Pennsylvania Railroad Company. One hundred men are employed and six ferry boats ply between Philadelphia and Camden. Drinking water from the city mains is supplied throughout the station and for lavatory purposes. This summer—1913—there was a dual water service, raw river water being pumped into the fire lines and used for flushing water closets. There was a four inch connection between the city pipes and the fire lines, provided with a gate valve, kept open, and a check valve. By order of the city water bureau an additional check valve and a drip were put in. Later the connection was severed, and there is now no connection between the fire lines and the water used for washing and drinking.

The river water at the ferries was pumped about the building with a pressure of fifty-five pounds. Prior to September 12th, 1913, there was no storage tank for the river supply, but on this date a tank was completed. It will be noted from the result of tests already shown that there was a gradual improvement in the water beginning in October prior to which time the dual connection had been severed. It cannot be definitely stated that this dual connection had any effect on the public water supply.

The other dual pipe connection in the ward is at the high pressure fire pumping station established by the city at Delaware Avenue and Arch Street. Here a two inch pipe connection is maintained between the drinking water system and the high pressure fire system which serves the congested business district of the city.

The object of this arrangement is to admit the city water and keep a low pressure on the fire lines. The connecting pipe is carried above the floor of the pump station so as readily to be observed by the attendants and is supplied with two gate valves and two check valves and a drip placed midway. There is also a pressure gauge on the line. The check valves are set so that the city water alone may pass through the pipes, that is, against any reversal of the current that would allow the raw river water to enter the drinking water main. The pressure from the city side is about thirty-five pounds and when the fire pump is operating the pressure from the raw water side is 250 pounds. As an additional safeguard, to

prevent the introduction of the raw river water into the drinking mains, the engineer has instructions when starting his fire pump, to close the gate valve on the side nearest the city. Should the valves leak and the check valve fail to close, it is readily seen that, with the excess of pressure in favor of the raw river water, this supply might be pumped into the drinking water system.

When an inspection of this plant was made by the Chief Engineer of the State Department of Health, the fire pump was started and in two minutes the pressure went up. The gate valve and the check on the raw water side of the connection leaked and water was pumped into the drip. The check and the gate valve on the filtered water side of the connection were tight.

This dual pipe connection has been looked upon as a possible source of contamination of the city's drinking water supply and the piping was placed above the floor line in order that the connection might be more closely observed. Should the check valves fail to hold at the time the fire pump is in service and the engineer neglect to close the gate valves, the raw water must, of necessity, be pumped into the drinking water main. There is, moreover, a possibility of sediment collecting in the check valves so that they may not close tight. This would be most likely to occur in the spring of the year or at other flood periods when a large amount of suspended matter is present in the river water.

Whether the presence of this dual connection actually has contaminated the city water is not definitely known, but the fact remains, as pointed out above, that samples collected at Station No. 17, which is the one most likely to be affected by raw water entering the system by way of the city fire pumping station, show a higher total count and B. Coli were found more frequently than at Station No. 18. Another interesting fact is that nearly all of the typhoid fever cases occurring in the ward in 1913 are located not far from the city's fire pumping station. Possibly this may be explained by the fact that the lower half of the ward, in which cases did not occur, is largely given over to business interests with the residential part of the ward lying in the northern half.

Taking up the typhoid fever for the Sixth Ward, the case record being shown in the following table, it will appear that in spite of the sand filters the cases did not decrease materially until the prefilters were put into service, and even then in the open season for the year 1909 nearly one-half of all the cases for the entire year occurred. A material decrease occurred the following year and this was probably aided by the introduction of hypochlorite of lime. In 1913, up to the first of November, nine cases had occurred which is one less than for the entire preceding year. The significant feature of this year's cases, however, is that they nearly all occurred during the open season and are in excess of the cases occurring during the same period of time in each of the four years preceding 1913.

TYPHOID FEVER CASES IN THE SIXTH WARD FOR SIX YEARS. POPULATION 6,400.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	2	7	2	0 Lime	0 Lime	0 Lime
February,	5	1	1	0 "	2 "	1 "
March,	1	0 PF.	2	0 "	1 "	0 "
April,	2	1	0	1 "	0 "	0 "
May,	1 F.	1	0	0	1 "	0 "
June,	1	0	0	1	2 "	1 "
July,	3	0	0	0	0 "	1 "
August,	6	3	3	1	0 "	2 "
September,	6	1	0	1	0 "	3 "
October,	1	0	0	0	1 "	1 "
November,	0	2	0	1	2 "	.....
December,	1	0	0 Lime	1 "	1 "	.....
Total,	29	16	8	6	10	9

For the open season of seven months—April to October inclusive—the cases occurring in the ward are shown in the following table. For 1913 there was more typhoid fever in the Sixth Ward than for any year except 1908.

Typhoid Fever Cases in the Sixth Ward in the Open Season, April to October Inclusive, For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	20	6	3	4	4	8

Of the nine cases for 1913, two were imported from places outside of the city and one man was a laborer along the city wharves with many opportunities of coming in contact with the raw river water. The remaining six have unknown sources of infection. Five of the nine cases are in a community group with a possibility of neighborhood infection.

Seventh Ward: In the Seventh Ward the city maintained no regular sampling station but did maintain special stations, No. 93 at South Broad and South Streets, and No. 94 at South Ninth and South Streets. The State Health Department established a sampling station at the same point as city special station No. 93.

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NO. 93 AND No. 94 DURING OCTOBER, 1913—SEVENTH WARD.

October.	Station No. 93.			Station No. 94.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 CC.	10 CC.		1 CC.	10 CC.
2,	160	+	+	70	−	+
6,	54	−	+	110	+	+
8,	174	−	+	100	+	+
10,	84	+	+	52	−	+
13,	99	+	+	160	+	+
15,	51	−	+	160	+	+
17,	69	+	+	110	−	+

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT WATER BUREAU STATION NO. 93, BROAD AND SOUTH STREETS—SEVENTH WARD, 1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	25	0	0	28	0	0
2,	.....	.....	.....	27	1	0	32	0	0
3,	.....	.....	.....	39	0	0	20	0	0
4,	.....	.....	.....	.....	.....	.....	12	0	0
5,	.....	.....	.....	60	0	0	16	0	0
6,	.....	.....	.....	16	0	0	5	0	0
7,	.....	.....	.....	60	2	1	.....	.....	.....
8,	.....	.....	.....	18	1	0	20	0	0
9,	.....	.....	.....	140	0	0	11	0	0
10,	.....	.....	.....	240	2	1	17	0	0
11,	.....	.....	.....	40	0	0	10	0	0
12,	.....	.....	.....	32	1	1	18	0	0
13,	.....	.....	.....	47	0	0	13	0	0
14,	.....	.....	.....	32	0	0	.....	.....	.....
15,	.....	.....	.....	54	0	0	.....	.....	.....
16,	.....	.....	.....	46	0	0	.....	.....	.....
17,	.....	.....	.....	12	0	0	.....	.....	.....
18,	.....	.....	.....	28	0	0	.....	.....	.....
19,	.....	.....	.....	30	0	0	.....	.....	.....
20,	.....	.....	.....	80	0	0	.....	.....	.....
21,	150	0	0	7	0	0	.....	.....	.....
22,	140	4	0	24	0	0	.....	.....	.....
23,	150	1	1	14	0	0	.....	.....	.....
24,	100	0	0	16	0	0	.....	.....	.....
25,	.....	.....	.....	15	0	0	.....	.....	.....
26,	.....	.....	.....	16	0	0	.....	.....	.....
27,	28	0	0	.....	.....	.....	.....	.....	.....
28,	100	0	0	12	0	0	.....	.....	.....
29,	120	1	0	35	0	0	.....	.....	.....
30,	80	0	0	60	0	0	.....	.....	.....
31,	60	0	0	.....	.....	.....	.....	.....	.....

The results of samples in this ward are similar to those in the other wards in the central district. There will be noticed, however, a slightly better water in the western part of this district. This difference will be more noticeable as the work in other wards is taken up.

The Seventh Ward is largely devoted to residential purposes. It extends from South Seventh Street on the east westwardly to the Schuylkill River and is three blocks wide, bounded on the north by Spruce Street and on the south by South Street. In this ward, particularly west of Broad Street, are the residences of the more resourceful citizens. Its population is 27,000.

A study of the table of typhoid fever cases in the Seventh Ward, appearing below, shows that there was a slight diminution in the number of cases following the installation of the sand filters and this was more marked after the prefilters were built. The records do not show, however, that they were entirely effective in reducing the cases, as the following year, namely, 1910, the cases exceeded by two those occurring in 1909. With the introduction of hypochlorite of lime the cases dropped fifty per cent. in the year 1911, but again increased in 1912 and for 1913, for the first ten months, there are more cases on record than for any year of the six except 1908. This holds good also for the cases occurring during the open season in the six year period which table is also shown below.

TYPHOID FEVER CASES IN THE SEVENTH WARD FOR SIX YEARS. POPULATION 27,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	19	5	7	2 Lime	2 Lime	0 Lime
February,	15	2	2	0 "	0 "	2 "
March,	10	4 PF.	3	0 "	2 "	1 "
April,	7	2	3	0 "	1 "	3 "
May,	9 F.	5	3	1	1 "	8 "
June,	4	1	1	2	3 "	6 "
July,	5	1	1	2	3 "	3 "
August,	7	5	5	3	7 "	5 "
September,	3	1	2	2	1 "	6 "
October,	6	4	8	3	1 "	2 "
November,	4	2	1	0	5 "	..
December,	4	1	0 Lime	3 "	2 "	..
Total,	93	33	35	18	28	36

Typhoid Fever Cases in the Seventh Ward in the Open Season, April to October Inclusive, For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	41	19	23	13	17	33

Of the thirty-six cases in the Seventh Ward occurring in 1913, twenty-five are located in the eastern half of the ward and of these twelve are in two groups at the extreme eastern end of the ward. These groups are made up of five and seven cases respectively. Three of the cases in the two groups are accounted for. With respect to the remaining nine there may be a possibility of neighborhood infection. In the extreme western end of the ward there are three cases in one house, one a primary and the other two secondary. Aside from the above groupings the cases are scattered without any seeming connection. Causes have been assigned for sixteen of the twenty-six cases. These are shown in the following table:

River water,	1	Bathing in river,	1
Imported,	6	Diagnosis doubtful,	1
Secondary,	2	Possible oyster infection,	1
Probable contact,	4		
			16

This leaves twenty cases of unknown origin. Of these one was a street laborer and may have come into contact with the infection while at work: three of the minors in this class ate cheap ice cream, and two of the minors attended the same school and may have associated with each other. There are no dual pipe connections in the Seventh Ward.

Eighth Ward: In the Eighth Ward the city had no regular sampling station and but one special sampling station. The special sampling station was on the corner of Broad and Spruce Streets and was also used by the State Health Department as a sampling station. The results obtained by the city at this special sampling station are as follows:

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATION NO. 96 DURING OCTOBER, 1913.

October.	Station No. 96.		
	Total Count.	B. Coli.	
		1 CC.	10 CC.
2,	73	−	+
6,	73	+	+
8,	83	−	+
10,	88	−	+
13,	75	+	+
15,	120	+	+
17,	17	−	+

This station is three squares north of City Station No. 93 in the Seventh Ward. The results at the two stations are similar. While the B. Coli results at the two stations do not correspond exactly on the same data, still as a whole they are almost identical.

The results obtained by the State at Station No. 96 are not quite as good as those obtained at Station No. 93. There is, however, an improvement during November and December over the results obtained in October. In the following table the results obtained by the State Health Department at this station are shown:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT WATER BUREAU SPECIAL STATION NO. 96, BROAD AND SPRUCE STREETS—1913—EIGHTH WARD.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	34	0	0	20	0	0
2,	.....	.....	.....	24	1	1	60	0	0
3,	.....	.....	.....	100	0	0	40	0	0
4,	.....	.....	.....	.....	.....	.....	30	1	1
5,	.....	.....	.....	15	0	0	24	0	0
6,	.....	.....	.....	38	0	0	.....	.....	.....
7,	.....	.....	.....	24	0	0	.....	.....	.....
8,	.....	.....	.....	0	0	0	20	0	0
9,	1,000	12	0	60	0	0	8	0	0
10,	350	2	0	280	1	0	20	0	0
11,	150	1	0	120	1	1	15	0	0
12,	240	1	1	48	1	0	14	0	0
13,	80	0	0	54	1	1	5	0	0
14,	.....	.....	.....	60	0	0	.....	.....	.....
15,	80	0	0	36	0	0	.....	.....	.....
16,	200	1	1	28	0	0	.....	.....	.....
17,	200	0	0	16	0	0	.....	.....	.....
18,	250	8	0	20	0	0	.....	.....	.....
19,	200	1	1	32	0	0	.....	.....	.....
20,	80	0	0	52	1	1	.....	.....	.....
21,	.....	.....	.....	56	0	0	.....	.....	.....
22,	.....	.....	.....	53	2	0	.....	.....	.....
23,	350	3	1	20	0	0	.....	.....	.....
24,	40	0	0	40	0	0	.....	.....	.....
25,	.....	.....	.....	8	0	0	.....	.....	.....
26,	.....	.....	.....	18	0	0	.....	.....	.....
27,	33	1	0	.....	.....	.....	.....	.....	.....
28,	80	0	0	10	0	0	.....	.....	.....
29,	70	0	0	28	0	0	.....	.....	.....
30,	32	0	0	32	1	0	.....	.....	.....
31,	34	0	0	.....	.....	.....	.....	.....	.....

There was but one dual pipe connection in the Eighth Ward, located in the plant of the Pierce, England & Company, situated on the southwest corner of North Twenty-fifth and Spruce Streets. A fire pump is maintained with a suction to the Schuylkill River, which forces the water about the plant under a pressure of a hundred pounds. From the six inch suction pipe and the eight inch discharge pipe there was a direct connection to the city main. On one line there was a check valve and a gate valve which was open. In August, 1913, the company started to put in two valves on each separate line, the work being completed on September 24th. Then the connections between the city supply and the river water supply were broken. It is not apparent from the results of tests as already given, that this dual pipe connection had any influence upon the quality of the city water.

In the Eighth Ward is to be found what has been considered the most desirable down town residence district in the city. This is located mostly west of South Broad Street, while east of this main thoroughfare the territory is more or less given over to commercial interests.

In the ten months of 1913—January to October inclusive—but ten cases of typhoid fever have occurred among 14,000 persons. Of these, five are of unknown origin, four are imported from outside the city and one is a possible contact, this latter being a driver on a laundry wagon and he may have handled soiled clothes infected with the typhoid fever bacillus. Four of the unknowns occurred early in the year and the history of these cases is very incomplete. Possibly a reinvestigation might have revealed a definite cause.

Below is given a table showing the typhoid fever for the Eighth Ward for six years and also a table showing the cases in this ward occurring during the open season. It will be noted by reference to the first table that in the year 1908, eighty-five per cent. of all the cases occurring during the year came down in the first four months of the year prior to the installation of the sand filters. The effect of the sand filters and of the preliminary filters is shown by the fact that there was a fifty per cent. reduction in cases the following year. In 1910 and 1911 there was a still further reduction, possibly influenced by the introduction of hypochlorite of lime. In 1912, there was very little change and for the first ten months in 1913 there have been fewer cases than in any of the preceding years studied. All but one of the 1913 cases came down in the open season:

TYPHOID FEVER CASES IN THE EIGHTH WARD FOR SIX YEARS. POPULATION 14,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	20	3	1	6 Lime	1 Lime	1 Lime
February,	16	3	2	0 "	0 "	0 "
March,	3	1 PF.	0	1 "	1 "	0 "
April,	8	0	0	0 "	2 "	0 "
May,	1 F.	1	3	0	1 "	4 "
June,	3	3	1	1	1 "	0 "
July,	1	2	1	0	2 "	1 "
August,	5	3	2	1	4 "	0 "
September,	2	2	3	2	0 "	2 "
October,	1	2	2	1	1 "	2 "
November,	3	3	3	3	3 "	.....
December,	3	4	2 Lime	0 "	2 "	.....
Total,	56	27	20	15	18	10

Typhoid Fever Cases in the Eighth Ward for Six Years—Open Season, April to October Inclusive.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	21	13	12	5	11	9

Ninth Ward: In the Ninth ward the city maintained no regular sampling station but had one special sampling station, located on South Tenth Street just above Chestnut Street. This station was also used by the State Health Department for a collecting point.

In the following table are shown the results of the samples collected by the city:

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATION NO. 95 DURING OCTOBER, 1913.

October.	Station No. 95.		
	Total Count.	B. Coli.	
		1 CC.	10 CC.
2,	86	—	+
6,	59	+	+
8,	150	+	+
10,	37	—	+
13,	60	+	+
15,	140	+	+
17,	110	+	+
20,	20	—	+

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU SPECIAL STATION NO. 95, SOUTH TENTH STREET NEAR CHESTNUT STREET —1913—NINTH WARD.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	13	1	0	20	1	1
2,	.....	.....	.....	14	0	0	12	1	1
3,	.....	.....	.....	38	0	0	16	0	0
4,	.....	.....	.....	.....	.....	.....	15	0	0
5,	.....	.....	.....	100	2	1	24	0	0
6,	.....	.....	.....	96	0	0	20	0	0
7,	.....	.....	.....	68	0	0	.....	.....	.....
8,	.....	.....	.....	47	3	0	10	0	0
9,	1,200	2	0	200	4	2	12	0	0
10,	260	1	0	240	0	0	10	0	0
11,	200	0	0	100	0	0	8	0	0
12,	450	0	0	28	0	0	16	0	0
13,	120	0	0	21	0	0	4	0	0
14,	.....	.....	.....	40	0	0	.....	.....	.....
15,	160	0	0	34	1	0	.....	.....	.....
16,	150	0	0	56	0	0	.....	.....	.....
17,	120	0	0	20	0	0	.....	.....	.....
18,	200	1	0	16	0	0	.....	.....	.....
19,	400	2	0	10	0	0	.....	.....	.....
20,	160	0	0	10	0	0	.....	.....	.....
21,	60	0	0	18	0	0	.....	.....	.....
22,	100	4	3	15	0	0	.....	.....	.....
23,	100	3	1	11	0	0	.....	.....	.....
24,	360	2	1	10	0	0	.....	.....	.....
25,	.....	.....	.....	8	0	0	.....	.....	.....
26,	.....	.....	.....	8	0	0	.....	.....	.....
27,	38	0	0	.....	.....	.....	.....	.....	.....
28,	150	1	1	36	0	0	.....	.....	.....
29,	40	0	0	36	0	0	.....	.....	.....
30,	31	0	0	40	0	0	.....	.....	.....
31,	40	0	0	.....	.....	.....	.....	.....	.....

The water in this ward is similar to that in the Eighth and Tenth Wards. The character of the water does not show the improvement in November and December that shows in the results from Stations near the Delaware River. This lack of improvement does not indicate a water of inferior quality but is due to the better results obtained in this district during October.

The Ninth Ward lies directly north of the Eighth Ward. It is three blocks wide and extends from Seventh Street west to the Schuylkill River. In this ward is found the heart of the business district and here are located the City Hall, the

terminal stations of the Pennsylvania Railroad and Philadelphia & Reading Railway, the leading department stores of the city, as well as numerous other business establishments. There is practically no residential district in this ward east of Broad Street and west of Broad Street the residences are found mostly along the north and south borders of the ward. No dual pipe connection was found in the Ninth Ward.

There has been but very little typhoid fever in this ward in the last four years. In 1908 there were twenty-four cases, half of which occurred in the first four months of the year, prior to the installation of the sand filters. Ten of those remaining came down during the open season. The following year there were only sixteen cases, of which nine had their onsets during the open season. The following year the effect of the filters and prefilters is noticed by the reduction of cases to five and in the two years following, when hypochlorite of lime was used, there were only two cases each year. In 1913, there have been four cases, three during the open season.

Of the four cases in 1913, one was a nurse in contact with other typhoid cases and is a secondary; another was a chauffeur that contracted the disease outside of the city; the remaining two are of unknown origin, but in the case of one of these it was impossible to obtain a complete history. The four cases are located in different parts of the ward. Below are shown in a table the cases recorded in the ward for six years:

Typhoid Fever Cases in the Ninth Ward For Six Years, Open Season, April to October Inclusive.

Year.	1908	1909	1910	1911	1912	1913
Cases, ...	11	9	1	1	1	3

TYPHOID FEVER CASES IN THE NINTH WARD FOR SIX YEARS. POPULATION 5,000.

Month.	1908	1909	1910	1911	1912	1913
January,	6	0	1	0 Lime.	0 Lime.	0 Lime.
February,	2	5	0	0 Lime.	1 Lime.	1 Lime.
March,	3	1 PF.	0	0 Lime.	0 Lime.	0 Lime.
April,	1	1	0	0 Lime.	0 Lime.	0 Lime.
May,	2 F.	1	0	0 Lime.	0 Lime.	1 Lime.
June,	0	0	0	0	0 Lime.	0 Lime.
July,	0	4	0	0	1 Lime.	0 Lime.
August,	2	2	0	1	0 Lime.	1 Lime.
September,	5	1	0	0	0 Lime.	0 Lime.
October,	1	0	1	0	0 Lime.	1 Lime.
November,	0	0	1	0	0 Lime.	
December,	2	1	2 Lime.	1 Lime.	0 Lime.	
Total,	24	16	5	2	2	4

Tenth Ward: In the Tenth Ward the city had one regular sampling station and established but one special sampling station. The State Health Department established no station in this ward but did collect one sample from the city sampling station.

In the following table is shown the results of the samples collected by the city at special Station No. 69.

RESULTS OF ANALYSES OF SAMPLES COLLECTED AT CITY SPECIAL STATION NO. 69, DURING OCTOBER, 1913.

	Total Count per C. C.	B. Coli.	
		1 C. C.	10 C. C.
2	280	+	+
6	38	+	+
8	180	+	+
10	140	−	+
13	70	−	+
15	57	−	+
17	57	−	+
20	42	−	+

This station which is located at 153 North Tenth Street, is in the eastern central part of the ward. The water mains supplying the district surrounding this station are small, branches from the thirty inch main fed by the forty-eight inch main terminating at Third and Market Streets. There is a possibility that the B. Coli present are due to deposits in the water lines as this is an old territory and the lines have been used many years. This may account for the appearance of B. Coli in one cubic centimeter more frequently than at regular Station No. 18 in the Sixth Ward.

Regular Station No. 16, located at North Sixteenth and Arch Streets receives water direct from the thirty inch main and therefore should give better results than at special Station No. 69. This is the case. In the following table are shown the results obtained at regular station No. 16:

RESULTS OF ANALYSES OF SAMPLES FROM CITY REGULAR STATION NO. 16—1913—TENTH WARD.

Day.	January.			February.			March.			April.			May.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1.															
2.															
3.	45	—	—	17	—	—	11	—	—						
4.															
5.													11	—	—
6.	55	—	—												
7.										47	—	—			
8.															
9.															
10.				57	—	—	230	—	—						
11.															
12.													24	—	—
13.	33	—	—												
14.										9	—	—	62	+	+
15.															
16.													22	—	—
17.				11	—	—	27	—	—						
18.															
19.													69	—	—
20.	15	—	—												
21.										19	+	+	13	—	—
22.															
23.													8	—	—
24.				8	—	—	20	—	+						
25.															
26.															
27.															
28.	36	—	—							33	—	—			
29.													6	—	—
30.															
31.							16	—	—						

RESULTS OF ANALYSES OF SAMPLES FROM CITY REGULAR STATION NO. 16—1913—TENTH WARD—Continued.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1.							8	—	+						
2.	8	—	—	17	—	—									
3.										38	—	—			
4.	17	—	—				48	—	—						
5.										22	—	+			
6.	9	—	—				19	—	—						
7.				21	—	—									
8.							16	—	—	12	+	+			
9.	35	—	—	20	—	—									
10.										12	—	+			
11.	10	—	—	12	—	+	92	+	+						
12.										37	—	—			
13.	20	—	—				55	—	—						
14.				18	—	—									
15.							110	—	+	9	—	—			
16.	27	—	—	16	—	-									
17.										10	—	—			
18.				14	—	—	250	—	—						
19.	46	—	—							24	—	—			
20.	9	—	—				84	+	+						
21.				51	—	—									
22.							180	—	—	58	—	+	17	—	—
23.	4	—	—	53	—	—							17	—	—
24.										17	—	+			
25.	20	—	—	26	—	—	42	—	+						
26.										140	—	—			
27.	16	—	—				29	—	—				45	—	—
28.				76	—	+									
29.							27	—	—				27	+	+
30.	12	—	+	13	—	—				37	—	—			
31.															

Comparing the above results with those obtained at regular Station No. 18, it will be found that they are very similar. Both of these stations obtain their supply from the thirty inch main fed direct from the forty-eight inch main from Lardner's Point.

With the Tenth Ward there is concluded the detailed study of the Central portion of the Central and South Philadelphia Water District. This ward lies directly north of the Ninth Ward, extends from Arch Street north to Vine, a distance of three squares and from North Seventh Street west to the Schuylkill River. It is more given over to residential purposes than the Ninth Ward, being about the same size but having a population of 19,000 or nearly four times that of the Ninth Ward. In the western end of the ward along the river bad housing conditions are encountered.

During the year 1913, up to the end of October, fifteen cases of typhoid fever occurred in the Tenth Ward, all but two of these coming down during the open season. In the tables which follow are shown the records of typhoid fever cases for the past six years. As relates to typhoid fever this ward is not different from the other wards in this Central district already discussed. The year 1908 is the high year followed in the subsequent years by a more or less marked reduction in typhoid fever, showing the effect of the introduction of filtered water into the district. The influence of the application of hypochlorite of lime is not as marked as in some of the other wards nor is there any great variation between years in the cases occurring during the open season.

Causes have been assigned to eight of the fifteen cases occurring in the first ten months of 1913. This leaves seven unknown, of which number four occurred early in the year and the history of these cases is incomplete and they have not been reinvestigated. As to the assigned causes, one is thought to have been due to contact with raw river water; one case was imported from outside the city; for another the diagnosis was doubtful; with respect to three it is thought that they possibly may have come in contact with other cases at their places of employment; and two others travelled at various times on river steamers where the drinking water supplied to the passengers was not above suspicion.

TYPHOID FEVER CASES IN THE TENTH WARD FOR SIX YEARS. POPULATION 19,000.

Month.	1908	1909	1910	1911	1912	1913
January,	11	3	2	1 Lime	3 Lime	0 Lime
February,	13	2	4	0 Lime	1 Lime	1 Lime
March,	6	1 PF.	0	0 Lime	1 Lime	1 Lime
April,	2	2	2	0 Lime	0 Lime	0 Lime
May,	6 F.	0	2	0	1 Lime	1 Lime
June,	4	0	2	0	1 Lime	3 Lime
July,	3	4	1	1	0 Lime	0 Lime
August,	1	8	0	2	9 Lime	2 Lime
September,	3	1	3	5	1 Lime	3 Lime
October,	4	5	4	1	3 Lime	4 Lime
November,	1	0	0	0	1 Lime	
December,	1	4	2 Lime	1 Lime	2 Lime	
Total,	55	30	22	11	23	15

Typhoid Fever Cases in the Tenth Ward in the Open Season, April to October Inclusive—For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	23	20	14	9	15	13

This completes a study by wards of the central part of this water district. It will be followed by a study by wards of the cases occurring in the eight wards making up the South Philadelphia portion of this large water district. All of the South Philadelphia district lies below South Street.

SOUTH PHILADELPHIA WATER DISTRICT.

Fourth Ward: In the Fourth Ward the city established one regular sampling station in June, 1913, at the Franklin Sugar Refinery. Two special city sampling stations Nos. 79 and 80, were instituted in October. The State Health Department collected samples during October, November and December, 1913, at the two city special stations.

In the following table are given the results collected at special Station No. 21, 701 South Front Street:

RESULTS OF ANALYSES OF WATER SAMPLES—CITY REGULAR STATION NO. 21—1913—FOURTH WARD.

Day	June.			July.			August.			September.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1,							6	—	—			
2,				16	—	—				11	—	—
3,							7	—	—	30	—	—
4,												
5,							2	—	—			
6,												
7,				24	—	—	20	—	—			
8,												
9,	16	—	+	5	—	—						
10,										6	—	—
11,	90	+	+	10	—	—	10	—	—			
12,										47	+	+
13,	29	+	+				120	—	+			
14,				40	—	+						
15,							160	—	—			
16,	70	—	+	170	—	—				8	—	—
17,												
18,	26	—	+	10	—	—						
19,							55	—	—	22	—	+
20,	21	—	+									
21,				13	—	—	36	—	—			
22,												
23,	15	—	—	29	—	—						
24,										5	—	—
25,	23	—	—	17	—	+						
26,							48	—	—	12	—	+
27,	53	—	—									
28,				4	—	—	28	—	—			
29,												
30,	6	—	—	11	—	—						
31,												

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NO. 79 AND NO. 80, FOURTH WARD, DURING OCTOBER, 1913.

October.	Station No. 79.			Station No. 80.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.
2,	180	+	+	139	+	+
6,	87	—	+	91	+	+
8,	210	—	+	150	—	+
10,	90	—	+	160	—	+
13,	140	—	+	170	—	+
15,	64	—	+	100	+	+
17,	64	+	+	180	—	+
20,	31	—	+	61	+	+

Station No. 79 is located at the corner of South Fifth and South Streets. Station No. 80 is located at the corner of Clymer and Swanson Streets, the samples coming from a tap in Shanahan's ice-cream factory where a large amount of water was used daily. The results of the samples collected by the State Health Department at these two stations are shown in the following table:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION NO. 79, FOURTH WARD, 516 SOUTH STREET, 1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	15	0	0	32	0	0
2,	.....	.....	.....	13	0	0	20	0	0
3,	.....	.....	.....	80	0	0	40	0	0
4,	.....	.....	.....	.....	.....	.....	32	0	0
5,	.....	.....	.....	40	0	0	20	0	0
6,	.....	.....	.....	56	0	0	12	0	0
7,	.....	.....	.....	20	0	0	.....	.....	.....
8,	.....	.....	.....	13	2	0	17	0	0
9,	550	0	0	200	0	0	12	0	0
10,	250	0	0	160	0	0	11	0	0
11,	200	4	0	30	0	0	6	0	0
12,	80	0	0	28	0	0	29	0	0
13,	150	0	0	32	0	0	14	0	0
14,	.....	.....	.....	30	0	0	.....	.....	.....
15,	120	1	1	42	0	0	.....	.....	.....
16,	200	1	1	36	0	0	.....	.....	.....
17,	250	0	0	16	0	0	.....	.....	.....
18,	250	4	0	12	0	0	.....	.....	.....
19,	130	2	1	.....	.....	.....	.....	.....	.....
20,	100	0	0	12	0	0	.....	.....	.....
21,	120	0	0	14	0	0	.....	.....	.....
22,	150	0	0	14	0	0	.....	.....	.....
23,	50	0	0	15	0	0	.....	.....	.....
24,	40	0	0	20	0	0	.....	.....	.....
25,	.....	.....	.....	9	0	0	.....	.....	.....
26,	.....	.....	.....	40	0	0	.....	.....	.....
27,	80	0	0	.....	.....	.....	.....	.....	.....
28,	60	0	0	28	0	0	.....	.....	.....
29,	60	0	0	19	0	0	.....	.....	.....
30,	48	1	0	20	0	0	.....	.....	.....
31,	56	0	0	.....	.....	.....	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU SPECIAL STATION NO. 80, FOURTH WARD, CLYMER AND SWANSON STREETS, 1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	36	1	0	50	0	0
2,	.....	.....	.....	34	0	0	24	0	
3,	.....	.....	.....	72	0	0	24	0	0
4,	.....	.....	.....	.....	.....	.....	20	0	0
5,	.....	.....	.....	32	0	0	40	1	0
6,	.....	.....	.....	32	0	0	14	0	0
7,	.....	.....	.....	30	0	0	.....	.....	.....
8,	.....	.....	.....	26	0	0	24	1	
9,	350	1	1	100	0	0	6	0	0
10,	250	4	1	140	0	0	12	0	0
11,	160	3	1	100	0	0	8	0	0
12,	150	2	1	60	0	0	34	0	0
13,	250	0	0	120	2	1	6	0	0
14,	.....	.....	.....	40	0	0	.....	.....	.....
15,	150	1	0	26	0	0	.....	.....	.....
16,	800	6	4	45	0	0	.....	.....	.....
17,	400	1	1	32	0	0	.....	.....	.....
18,	550	3	3	20	0	0	.....	.....	.....
19,	125	0	0	150	15	0	.....	.....	.....
20,	100	0	0	12	0	0	.....	.....	.....
21,	200	0	0	13	0	0	.....	.....	.....
22,	30	0	0	24	10	0	.....	.....	.....
23,	35	0	0	29	0	0	.....	.....	.....
24,	80	1	0	14	0	0	.....	.....	.....
25,	.....	.....	.....	6	0	0	.....	.....	.....
26,	.....	.....	.....	24	1	1	.....	.....	.....
27,	240	0	0	.....	.....	.....	.....	.....	.....
28,	100	0	0	12	0	0	.....	.....	.....
29,	80	0	0	16	2	1	.....	.....	.....
30,	45	0	0	50	0	0	.....	.....	.....
31,	40	0	0	.....	.....	.....	.....	.....	.....

A forty-eight inch main bringing water direct from Lardner's Point pumping station passes down Broad Street. From this large main a thirty inch main goes east on Bainbridge Street passing through the centre of the Fourth Ward, consequently, the Fourth Ward throughout its entire length should receive a relatively fresh water from the Torresdale filters and it would be expected that the bacteriological results would be fairly uniform. The results obtained by the city and the State indicate this with the exception of those results obtained in October, prior to October 24th. Before this date the water mains throughout the entire Torresdale district had been flushed. Until October 14th, an extra large force of men were flushing the mains, but on October 14th this force was reduced to the usual number employed in this work. It would appear that as soon as this disturbing of the mains had ceased and the sediment in the pipes had again become adjusted, the results in this ward, as in several other wards in this district, seem to become free from B. Coli and the total count is considerably diminished. Where the sampling station is located on a small distributing main at some distance from the main distributor the bacterial count is found to be higher and B. Coli appear more frequently.

The study of typhoid fever in the Fourth Ward as well as Wards Three, Two, and One, which are to follow, must be considered in its relation to the housing conditions. The section thus outlined constitutes one of the bad housing areas of the city where properties are deteriorating and are creating problems which require larger expenditures of public funds to care for the victims of disease and neglect which such slum areas create. The ward is congested, and inhabited largely by a foreign population; the houses are small and overcrowded, with poor drainage facilities. In other words the physical conditions aid in the extension of communicable diseases. In addition it is extremely difficult in many instances for the medical inspector to secure definite data relative to the patients. In the Fourth Ward in the year 1913, up to November 1st, there were thirty-two cases of typhoid fever. Among these were eighteen Italians, five Jews, three Russians, one Norwegian, one Pole, one Irishman and three Americans. This will give some idea of the difficulties that are encountered by the inspector as many of these foreigners are unable to speak English.

Of the thirty-two cases occurring in 1913, twenty-nine were returned to the City Medical Inspector for a reinvestigation. Even after this had been done the origin of but eight of the thirty-two cases has been ascertained. Four of the cases were imported, one was not typhoid fever, one was a possible secondary, and two may possibly be due to neighborhood infection through flies. This leaves twenty-four unknown cases. In the following tables are shown the records of typhoid fever cases by months for six years and for the open season during these years.

TYPHOID FEVER CASES IN THE FOURTH WARD FOR SIX YEARS. POPULATION 22,000.

Month.	1908	1909	1910	1911	1912	1913
January,	17	3	4	1 Lime.	0 Lime.	2 Lime.
February,	11	4	2	2 Lime.	0 Lime.	0 Lime.
March,	13	4 PF.	2	0 Lime.	0 Lime.	0 Lime.
April,	8	2	1	3 Lime.	0 Lime.	2 Lime.
May,	4 F.	1	2	1	2 Lime.	3 Lime.
June,	1	1	1	1	5 Lime.	9 Lime.
July,	2	3	0	3	8 Lime.	6 Lime.
August,	5	4	6	4	4 Lime.	6 Lime.
September,	11	2	5	1	3 Lime.	3 Lime.
October,	4	4	3	2	3 Lime.	1 Lime.
November,	0	2	4	2	2 Lime.	
December,	1	3	2 Lime.	1 Lime.	1 Lime.	
Total,	77	33	34	27	28	32

Typhoid Fever Cases in the Fourth Ward in the Open Season, April to October Inclusive, For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases,	35	17	20	21	25	30

The introduction of filtered water, as indicated in the preceding table, was followed by a material reduction in typhoid fever cases in this ward. The addition of hypochlorite of lime to the filtrate does not appear to have had any marked effect in reducing cases. After the first filtered water was introduced in 1908, followed by the prefiltered water in 1909, there was a reduction of fifty per cent. in the cases occurring during the open season in 1909 as compared with the same season in 1908. There was little change in the totals for the open season for the following years except that in 1913 the total is slightly higher than the preceding year.

Third Ward: Neither the City nor the State Health Department maintained a sampling station in the Third Ward which is directly south of the Fourth Ward. This ward is not supplied with water directly from the express main on Broad Street, but either from the thirty inch branch extending midway through the Fourth Ward or from the twenty inch branch passing through the Second Ward. Consequently the results of sampling in the Fourth and Second Wards apply to the Third Ward.

The Third Ward is similar in character to the Fourth, with a large foreign element in its population, many Jews and Italians living here. Bad housing conditions were also present and difficulty was encountered in securing definite information relative to typhoid fever cases. Of the forty-five cases for 1913, thirty were reinvestigated by the city medical inspectors at the request of the State officers.

Forty-five cases of typhoid fever occurred in 1913 in the Third Ward up to the first of November. Most of these were located in the north central part of the ward, in several instances being closely grouped. Causes have been assigned to twenty, leaving twenty-five of unknown origin. Ten of these were included in the re-inspection cases, but they had moved and the inspectors were unable to place them. In the following table are shown the cases with known sources of infection:

Typhoid Fever Cases in the Third Ward, 1913—Determined Causes of Infection.

Possible neighborhood infection,	5
Imported,	9
Secondary,	1
Drank river water,	2
Bathed in river,	2
Travel on river steamer,	1
Total,	20

The records of cases by months and for the open season for six years are shown in the following table:

TYPHOID FEVER CASES IN THE THIRD WARD FOR SIX YEARS.

POPULATION 26,000.

Month.	1908	1909	1910	1911	1912	1913
January,	14	0	4	0 Lime.	1 Lime.	1 Lime.
February,	14	1	4	1 Lime.	2 Lime.	2 Lime.
March,	10	3 PF.	0	0 Lime.	0 Lime.	3 Lime.
April,	9	3	1	1 Lime.	0 Lime.	5 Lime.
May,	6 F.	0	3	3	1 Lime.	9 Lime.
June,	3	1	2	0	1 Lime.	6 Lime.
July,	4	5	2	3	4 Lime.	6 Lime.
August,	15	11	9	5	10 Lime.	4 Lime.
September,	10	2	6	4	3 Lime.	6 Lime.
October,	4	2	3	1	3 Lime.	3 Lime.
November,	0	3	0	2	0 Lime.	
December,	1	0	1 Lime.	0 Lime.	4 Lime.	
Total,	90	31	35	20	29	45

Typhoid Fever Cases in the Third Ward in the Open Season, April to October Inclusive For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases, ...	90	31	35	20	29	45

The same features as to typhoid cases are noted in the Third Ward as occurred in the Fourth, namely, a marked reduction after filtered water was introduced affected very slightly, if any, by the addition of hypochlorite of lime most of the cases occurring during the open season.

Second Ward: In the Second Ward the city maintained regular sampling Station No. 26, from the beginning of 1911 until May 1st, 1913, at which time Station No. 26, located at 1000 South Sixth Street, was moved to South Fifth and Carpenter Streets, one square away, and called Station No. 25. The city also established special Stations Nos. 81, 87, and 92. The State Health Department established sampling stations at city special Stations Nos. 87 and 92.

In the following table are shown the monthly average, maximum and minimum total count of bacteria for the cubic centimeter during 1911, 1912 and 1913 at city regular Stations Nos. 25 and 26.

RESULTS OF ANALYSES OF WATER SAMPLES—CITY REGULAR STATIONS NOS. 25 AND 26 —SECOND WARD.

Month.	1911.			1912.			1913.		
	Total Count.			Total Count.			Total Count.		
	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
January, ...	1,129	5,200	45	50	140	15	36	70	8
February, ...	523	920	150	118	500	15	17	36	4
March, ...	410	2,000	55	113	420	28	51	120	10
April, ...	344	1,200	18	64	100	15	98	220	18
May, ...	113	110	10	80	190	20	147	490	12
June, ...	38	140	15	50	90	21	121	690	12
July, ...	23	40	8	44	300	10	37	72	6
August, ...	30	78	10	25	55	12	64	140	10
September, ...	60	240	20	33	85	14	57	130	12
October, ...	87	280	38	46	30	10	61	75	42
November, ...	192	840	18	29	50	18			
December, ...	124	290	30	69	305	20			

B. Coli determinations were made at the Station during 1913, until the end of October. The results obtained are set forth in the following table along with total counts to the cubic centimeter obtained during this period:

TOTAL COUNTS AND B. COLI DETERMINATIONS AT STATIONS NOS. 25 AND 26, SECOND WARD—1913.

Day.	January.			February.			March.			April.			May.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1,										52	—	—	23		
2,							10	—	—						
3,	45			20	—	—				100					
4,							15	—	+				120	—	+
5,				36	—	+									
6,	46	+	+				13			77	—	+	420	+	+
7,				15											
8,	19	+	+							100	—	—	120		
9,							110	—	—						
10,	8			16	—	—				127					
11,							115	—	—				48	—	—
12,															
13,	18	—	—				29			18	—	—	41	+	+
14,				62											
15,	26	—	—							44	—	—	140	—	—
16,							16	—	—				140	—	—
17,	55			5	—	—				220					
18,							28	—	—				280	+	+
19,				6	—	—									
20,	15	—	—							64	—	—	490	+	+
21,				4											
22,	34	—	—							186	—	+	32	—	—
23,															
24,	55			7	—	—	66	—	—	120					
25,													12	—	—
26,				6	—	—	120	—	—						
27,	70	+	+							160	—	—	34	—	+
28,				7			37								
29,	38	—	+							18	—	—			
30,															
31,	45						50	—	—						

TOTAL COUNTS AND B. COLI DETERMINATIONS AT STATIONS NOS. 25 AND 26, SECOND WARD—1913—Continued.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1,							98	—	—						
2,	62	—	—	18	—	—				25	—	+			
3,															
4,	690	-	+				24	—	+	12	—	—			
5,															
6,	120	+	+				61	—	—						
7,				22	—	—									
8,							60	—	—						
9,	30	—	+							32	—	+			
10,															
11,	29	—	+	6	—	—	25	—	+	15	—	+			
12,															
13,	12	—	—				80	—	—						
14,				40	—	+									
15,							140	+	+						
16,	18	—	+	72	—	+				96	—	+			
17,															
18,				40	—	+				120	—	+			
19,	400	—	+				42	—	—						
20,	80	—	—												
21,				16	+	+	51	—	—						
22,															
23,	34	—	+	58	+	+				28	—	—	75	+	+
24,															
25,	54	+	+	15	+	+	17	—	+	56	+	+			
26,															
27,	18	—	—				10	—	+						
28,															
29,													65	—	+
30,	23	—	—	53	—	+				130	+	+	42	—	—
31,															

RESULTS OF ANALYSES OF SAMPLES COLLECTED AT CITY SPECIAL STATIONS NOS. 81, 87, AND 92, DURING OCTOBER, 1913.

October.	Station No. 81.			Station No. 87.			Station No. 92.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
2,	210	+	+	76	+	+	63	−	+
6,	25	−	−	78	+	+	190	+	+
8,	180	−	−	110	−	+	120	+	+
10,	74	−	+	110	−	+	84	−	+
13,	18	+	+	76	−	+	70	−	+
15,	17	−	+	120	−	+	120	+	+
17,	10	−	−	95	+	+	99	−	+
20,	26	−	+	50	−	+	27	+	+

Station No. 81 is located on the corner of South Front and Federal Streets; Station No. 87 at the corner of Passyunk and Washington Avenues; Station No. 92 on the corner of South Broad Street and Washington Avenue.

The results of samples collected by the State Health Department at city special Stations Nos. 87 and 92 are shown in the following tables:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU SPECIAL STATION NO. 87, SECOND WARD, PASSYUNK AVENUE AND WASHINGTON AVENUE, 1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	20	0	0	18	0	0
2,	.....	.....	.....	20	0	0	24	0	0
3,	.....	.....	.....	18	1	0	20	0	0
4,	.....	.....	.....	.....	.....	.....	28	0	0
5,	.....	.....	.....	48	0	0	16	0	0
6,	.....	.....	.....	60	0	0	10	0	0
7,	.....	.....	.....	28	0	0	.....	.....	.....
8,	850	6	0	13	0	0	8	0	0
9,	.....	.....	.....	125	0	0	10	0	0
10,	150	1	0	120	1	0	7	0	0
11,	120	1	1	34	0	0	10	0	0
12,	60	1	0	.....	.....	.....	16	0	0
13,	100	0	0	36	2	1	10	0	0
14,	.....	.....	.....	72	0	0	.....	.....	.....
15,	140	1	1	21	0	0	.....	.....	.....
16,	200	0	0	20	0	0	.....	.....	.....
17,	120	0	0	48	1	0	.....	.....	.....
18,	85	2	0	12	0	0	.....	.....	.....
19,	80	2	1	.....	.....	.....	.....	.....	.....
20,	150	0	0	12	0	0	.....	.....	.....
21,	50	0	0	20	0	0	.....	.....	.....
22,	80	1	1	19	0	0	.....	.....	.....
23,	60	2	0	23	0	0	.....	.....	.....
24,	60	2	0	13	0	0	.....	.....	.....
25,	.....	.....	.....	21	0	0	.....	.....	.....
26,	.....	.....	.....	9	0	0	.....	.....	.....
27,	80	0	0	.....	.....	.....	.....	.....	.....
28,	120	1	1	20	0	0	.....	.....	.....
29,	50	0	0	35	1	1	.....	.....	.....
30,	70	2	1	50	0	0	.....	.....	.....
31,	48	0	0	.....	.....	.....	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION NO. 92, SECOND WARD, SOUTH BROAD STREET AND WASHINGTON AVENUE, 1913.

October.	Bacteria per C. C.		
	Total.	Pink Colonies.	B. Coli.
10,	200	1	0
11,	200	0	0
12,	250	0	0
13,	200	1	1
14,	.....	.....	.....
15,	150	0	0
16,	150	0	0
17,	150	0	0
18,	140	2	0
19,	130	0	0
20,	200	2	1
21,	150	0	0
22,	120	0	0

From the forty-eight inch main passing down Broad Street there is a twenty inch branch at Washington Avenue, which passes east along Washington Avenue and thus goes through the central part of the Second Ward supplying to this ward water direct from Lardner's Point. Because of this method of delivery it would be expected that those sampling stations near Washington Avenue would show the water to be of a good quality. City regular sampling Stations No. 25 and No. 26 are located one square north of Washington Avenue. City special sampling Station No. 81 is one square south of Washington Avenue, and Stations Nos. 87 and 92 are on Washington Avenue. The results obtained by the city at regular Stations Nos. 25 and 26 show an improvement in the water in 1912 over the results obtained in 1911 and an improvement in 1913 over the results obtained in 1912. From the B. Coli results obtained in 1913 it is found that the percentage of samples showing positive B. Coli tests increase in the latter part of the year. During September and until October 14th, the mains were being disbursed by an extra amount of flushing through fire hydrants. The results obtained by the State Health Department at City Stations Nos. 87 and 92 and those obtained by the city at these stations indicate the disturbance to be due to flushing, and, as in other cases, the results improve rapidly in the latter part of October, the total count being smaller in November and December and B. Coli appearing less frequently. During October, 1913, at Station No. 87 the State obtained twelve samples showing pink colonies and six with B. Coli out of twenty samples. In November six samples out of twenty-six showed pink colonies and but two showed B. Coli. In December there were no pink nor B. Coli colonies in twelve samples.

In the Second Ward, as in the Fourth and Third, bad housing conditions are encountered extending west as far as South Tenth Street. The physical conditions are also similar, the ward being congested and the home for many foreigners. Of the seventy-six cases of typhoid fever in 1913, sixty were returned to the city authorities for reinvestigation which in a number of instances served to clear up the source of infection. Causes have been assigned to forty-four cases leaving thirty-two of unknown origin, six of which could not be located in the reinvestigation. The assigned causes are shown in the following table:

SECOND WARD TYPHOID FEVER CASES—1913.

Determined Causes.	Cases.
Imported,	13
Secondary,	12
Contact,	8
Worked on river,	7
Stetson's Hat Factory,	5
On river steamer,	1
Bathed in river,	1
Drank river water,	1
Neighborhood infection,	1
Total,	44
Unknown,	32
Total cases,	76

As in the Fourth and Third Wards the influence of filtered water can be perceived by a study of the tables following, which show the typhoid fever cases in the second Ward for six years. As in the other two wards in 1908 the winter typhoid was heavy, being reduced after the introduction of filtered water in May. There were a hundred and thirty-nine cases in 1908, eighty-six of which occurred prior to the use of filtered water. The following year showed a reduction of fifty per cent. a slight increase in 1910, with a marked reduction in the next year. In 1912 there was an increase in the number of cases and in 1913 a still further increase, but in no year has the number of cases equaled 1908. Throughout the six year period most of the cases occurred during the open season and possibly, if the facts were known concerning the years prior to 1913, many of these cases could be charged to infections occurring outside the city. The use of hypochlorite of lime does not seem to have been accompanied by any great diminution in the number of cases. The tables for six years follow:

Typhoid Fever Cases in the Second Ward During the Open Season, April to October Inclusive—For Six Years.

Year.	1908	1909	1910	1911	1912	1913
Cases, ...	53	39	53	33	52	69

TYPHOID FEVER CASES IN THE SECOND WARD FOR SIX YEARS—POPULATION 40,000.

Month.	1908	1909	1910	1911	1912	1913
January,	25	4	8	1 Lime.	2 Lime.	1 Lime.
February,	28	8	7	1 Lime.	4 Lime.	2 Lime.
March,	23	6 PF.	1	1 Lime.	0 Lime.	4 Lime.
April,	10	4	1	1 Lime.	2 Lime.	3 Lime.
May,	6 F.	3	5	2	4 Lime.	16 Lime.
June,	2	2	8	1	9 Lime.	13 Lime.
July,	6	4	4	6	9 Lime.	17 Lime.
August,	6	9	9	18	16 Lime.	8 Lime.
September,	19	7	10	3	4 Lime.	7 Lime.
October,	4	10	16	2	8 Lime.	5 Lime.
November,	2	7	6	2	4 Lime.	7 Lime.
December,	8	8	3 Lime.	2 Lime.	4 Lime.	
Total,	139	72	83	40	66	76

In the Second Ward one dual pipe connection was found. This is at the foot of Washington Avenue on one of the piers owned by the Pennsylvania Railroad Company and leased by the International Mercantile Marine Company. There are five steamship lines docking at these piers which are numbered 46, 48, 53, 55, and 57. These boats ply between Philadelphia and South American and European ports and engage in passenger and freight transportation. They obtain drinking water from the domestic water lines on the piers and also from the river water boats, depending upon convenience. About three hundred men are employed on these piers.

City water is supplied to the piers for drinking purposes and raw river water, in a separate line of pipes, for fire purposes. Fire pumps are maintained and are tested every night up to the required pressure stipulated by the Fire Underwriters' Association. It is deemed advisable and necessary to maintain pressure in these fire lines and consequently there is a six inch pipe connection to the city mains. On this connection there is a stop valve, which was kept open until the fall of 1913, and also a check valve to prevent the raw river water from flowing back into the city mains. If this check valve leaked there was nothing to prevent the river water from leaking into the city mains. During the summer of 1913, the City Water Bureau and the City Board of Health required the company to put in an additional check valve and to keep the stop valve shut and sealed and also to install a water tank on standards. Such a tank was put into service but the company did not sever the six inch connection with the city main, arguing that enough water could not be stored in the tank to supply the fire lines before the city fire apparatus arrived. The Chief Engineer of the State Health Department maintained that the six inch connection should be severed and a pumping engine installed connecting with the city main and delivering city water into the tank when needed, thus obviating any possibility of back flow of river water into the city mains and also meet the requirements of the company. Consequently the city authorities issued an order to this effect.

The sampling station nearest this dual pipe connection was city special station No. 81, corner of South Front and Federal Streets, at least three blocks away. By reference to the results already given of analyses of samples from this station it does not appear that the presence of the above mentioned dual pipe connection had any material effect on the quality of the water in this locality. Moreover, there were no typhoid fever cases in its immediate vicinity.

First Ward: In the First Ward the city maintained regular stations Nos. 22, 23, 24, and 27, and special sampling stations Nos. 82 and 86. The State Health Department collected twenty water samples from two fire plugs and also from the city sampling station No. 82.

The city regular Stations Nos. 22 and 24 are located in the northeastern part of the ward; Station No. 23 is in the southeastern part, and Station No. 27 in the central part. Station No. 22 was maintained only during June and July, 1913. Stations Nos. 23 and 27 were established in June, and Station No. 24 in July, 1913. In the following tables are the results obtained at these stations:

RESULTS OF ANALYSES OF WATER SAMPLES FROM CITY REGULAR STATION NO. 22, FIRST WARD—1913.

Day.	June.			July.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1,	.....	.....	.....	.....	.....	.....
2,	84	—	—	.....	.....	.....
3,	.....	.....	.....	.....	.....	.....
4,	.....	.....	.....	.....	.....	.....
5,	.....	.....	.....	.....	.....	.....
6,	.....	.....	.....	.....	.....	.....
7,	.....	.....	.....	24	—	—
8,	.....	.....	.....	.....	.....	.....
9,	28	—	—	110	—	.....
10,	.....	.....	.....	.....	.....	.....
11,	59	—	—	22	—	—
12,	.....	.....	.....	.....	.....	.....
13,	35	—	—	.....	.....	.....
14,	.....	.....	.....	12	—	+
15,	.....	.....	.....	.....	.....	.....
16,	110	+	+	260	—	—
17,	.....	.....	.....	.....	.....	.....

RESULTS OF ANALYSES OF WATER SAMPLES FROM CITY REGULAR STATION NO. 22, FIRST WARD—1913—Continued.

Day.	June.			July.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.
18,	38	+	+	57	—	—
19,	.....	.....	.....	.....	.....	.....
20,	80	—	+	.....	.....	.....
21,	.....	.....	.....	.....	.....	.....
22,	.....	.....	.....	.....	.....	.....
23,	50	—	+	.....	.....	.....
24,	.....	.....	.....	.....	.....	.....
25,	46	+	+	.....	.....	.....
26,	.....	.....	.....	.....	.....	.....
27,	29	—	+	.....	.....	.....
28,	.....	.....	.....	.....	.....	.....
29,	.....	.....	.....	.....	.....	.....
30,	80	+	+	.....	.....	.....

RESULTS OF ANALYSES OF SAMPLES FROM CITY REGULAR STATION NO. 23, FIRST WARD—1913.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1.							66	+	+						
2.				48	−	+				15	−	+			
3.							36	−	−	25	−	−			
4.							42	−	+						
5.															
6.				15	−	−									
7.							30	−	−	56	+	+			
8.				24	−	+									
9.	26	−	−							42	−	−			
10.				10	−	+	15	−	−						
11.	100	−	−												
12.							80	+	+						
13.	64	+	+												
14.				19	−	+	66	−	−						
15.										6	−	−			
16.	38	+	+	120	−	+									
17.										29	−	+			
18.				17	−	+									
19.	29	−	+				13	−	+						
20.	57	+	+										15	−	−
21.				12	−	+	39	−	+						
22.										38	−	+			
23.	51	−	−												
24.															
25.	66	+	+	13	−	−				250	+	+			
26.							56	+	+						
27.	16	−	+				42	−	+				19	−	−
28.				18	−	+									
29.										11	−	−	35	−	−
30.	62	+	+	180	+	+									

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NOS. 82 AND 86—FIRST WARD—1913.

October.	Station No. 82.			Station No. 86.		
	Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.
2,	130	+	+	95	−	−
6,	71	+	+	21	−	−
8,	160	+	+	79	−	−
10,	85	−	+	120	+	+
13,	71	+	+	32	−	+
15,	71	+	+	68	−	+
17,	58	+	+	100	+	+
20,	74	−	+	34	−	−

RESULTS OF ANALYSES OF WATER SAMPLES AT CITY REGULAR STATION NO. 24—FIRST WARD—1913.

Day.	July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1.				71	+	+						
2.							5	−	−			
3.												
4.				78	−	−	12	+	+			
5.												
6.				36	−	−						
7.												
8.				25	−	−						
9.							7	−	−			
10.												
11.				22	−	−	39	+	+			
12.												
13.				88	−	−						
14.												
15.				180	−	−						
16.							9	−	−			
17.												
18.							15	−	+			
19.				6	−	−						
20.												
21.	16	−	−	65	−	−						
22.										23	−	−
23.	37	−	+				10	−	−			
24.												
25.	19	−	+				110	+	+			
26.				39	+	+						
27.												
28.	26	−	+	18	−	−				29	+	+
29.												
30.	250	−	−				25	−	−	44	−	−
31.												

RESULTS OF ANALYSES OF WATER SAMPLES FROM CITY REGULAR STATION NO. 27—FIRST WARD—1913.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.		1 C.C.	10 C.C.
1.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2.	.....	.....	.....	40	—	+	.....	.....	.....	110	—	+	.....	.....	.....
3.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4.	.....	.....	.....	.....	.....	.....	39	—	+	190	—	—	.....	.....	.....
5.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6.	.....	.....	.....	.....	.....	.....	150	—	+	.....	.....	.....	.....	.....	.....
7.	.....	.....	.....	40	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
8.	.....	.....	.....	.....	.....	.....	37	—	—	.....	.....	.....	.....	.....	.....
9.	.....	.....	.....	70	+	+	.....	.....	.....	24	+	+	.....	.....	.....
10.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11.	34	—	—	6	—	+	14	—	—	29	—	+	.....	.....	.....
12.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13.	28	—	+	120	+	+	.....	.....	.....	.....	.....	.....	.....	.....	.....
14.	.....	.....	.....	14	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
15.	.....	.....	.....	.....	.....	.....	320	+	+	.....	.....	.....	.....	.....	.....
16.	32	—	+	110	—	+	.....	.....	.....	210	+	+	.....	.....	.....
17.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18.	.....	.....	.....	94	+	+	.....	.....	.....	84	+	+	.....	.....	.....
19.	230	+	+	.....	.....	.....	250	—	—	.....	.....	.....	.....	.....	.....
20.	560	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
21.	.....	.....	.....	82	—	+	96	—	+	.....	.....	.....	.....	.....	.....
22.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	310	+	+
23.	37	—	—	230	+	+	.....	.....	.....	31	—	—	.....	.....	.....
24.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25.	76	+	+	33	—	+	.....	.....	.....	91	—	+	.....	.....	.....
26.	.....	.....	.....	.....	.....	.....	20	—	+	.....	.....	.....	.....	.....	.....
27.	15	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28.	.....	.....	.....	32	—	—	17	—	—	.....	.....	.....	75	+	+
29.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30.	16	—	—	64	+	+	.....	.....	.....	480	+	+	31	—	+
31.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

From these tables it will be noted that the results obtained at Station No. 27 differ from those obtained at the other stations, the total count usually being higher and B. Coli more frequent. The cause of this difference will be discussed later in the remarks pertaining to the entire water supply for the First Ward. The State Health Department collected samples at city special Station No. 82, results of which are shown in the following table:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY SPECIAL STATION NO. 82—FIRST WARD—1913.

Day.	October.			November.			December.		
	Total Count.	Pink Col.	B. Coli. 1 c. c.	Total Count.	Pink Col.	B. Coli. 1 c. c.	Total Count.	Pink Col.	B. Coli. 1 c. c.
1,	.....	.....	.....	15	0	0	60	0	0
2,	.....	.....	.....	30	0	0	24	0	0
3,	.....	.....	.....	22	0	0	32	0	0
4,	.....	.....	.....	—	—	—	30	0	0
5,	.....	.....	.....	80	0	0	44	0	0
6,	.....	.....	.....	33	0	0	16	0	0
7,	.....	.....	.....	20	0	0	—	—	—
8,	.....	.....	.....	32	0	0	24	0	0
9,	.....	.....	.....	200	0	0	12	0	0
10,	350	2	1	150	0	0	12	0	0
11,	300	1	1	80	0	0	10	0	0
12,	250	2	0	24	0	0	10	0	0
13,	350	0	0	60	0	0	14	0	0
14,	—	—	—	32	0	0	.....	.....	.....
15,	200	0	0	62	0	0	.....	.....	.....
16,	1,200	6	0	42	0	0	.....	.....	.....
17,	460	0	0	50	0	0	.....	.....	.....
18,	450	3	0	15	0	0	.....	.....	.....
19,	240	1	0	16	1	0	.....	.....	.....
20,	100	0	0	14	0	0	.....	.....	.....
21,	120	2	0	10	0	0	.....	.....	.....
22,	100	0	0	12	0	0	.....	.....	.....
23,	66	0	0	22	0	0	.....	.....	.....
24,	45	1	0	17	0	0	.....	.....	.....
25,	—	—	—	6	0	0	.....	.....	.....
26,	—	—	—	12	0	0	.....	.....	.....
27,	27	0	0	—	—	—	.....	.....	.....
28,	100	1	1	18	1	0	.....	.....	.....
29,	36	0	0	25	1	1	.....	.....	.....
30,	43	1	0	30	0	0	.....	.....	.....
31,	48	0	0	.....	.....	.....	.....	.....	.....

In this ward two fire hydrants were selected for the collection of muddy water samples, one at Cross and South Fifth Streets near the central part of the ward and another on Wilder Street near South Second Street in the northwestern part. The gate valve on South Fifth Street was closed so that the supply for the line came from South Fourth Street only, making the hydrant act as a blow-off on a dead end. Before the closing of the gate valve a sample was collected from a tap at the corner of South Fifth and Tasker Streets. Before the first sample was collected from the hydrant, it had been opened and the water allowed to flow a short time.

Before collecting the third sample the hydrant was opened and closed three times as rapidly as possible. After the collection of this sample the water was allowed to run continuously at about one-fourth flow and before the next sample was collected the hydrant was opened to the full extent and then partly closed. In the following table are shown the results obtained from the analyses of the samples secured at the hydrant at Cross and South Fifth Streets:

SERIES OF MUDDY WATER TESTS BY STATE HEALTH DEPARTMENT AT FIRE HYDRANT AT CROSS AND SOUTH FIFTH STREETS—FIRST WARD—OCTOBER 14, 1913.

Sample.	Hour of Collection.	Bacteria per c. c.		
		Total Count.	Pink Colonies.	B. Coli.
No. 1—Tap at S. 5th and Tasker streets.	11:00 A. M.,	100	3	3
No. 2—Fire Hydrant,	11:10 A. M.,	1,200	4	4
No. 3—Fire Hydrant,	11:50 A. M.,	900	8	4
No. 4—Fire Hydrant,	12:15 P. M.,	900	8	4
No. 5—Fire Hydrant,	12:38 P. M.,	1,200	6	4
No. 6—Fire Hydrant,	1:14 P. M.,	800	4	0
No. 7—Fire Hydrant,	2:50 P. M.,	600	4	0
No. 8—Fire Hydrant,	3:50 P. M.,	300	1	1

The results at this station indicate that the water became better as the flow at the hydraut continued. Throughout the entire test period the water was turbid when the hydrant was open full but the turbidity was not so pronounced at the time of the collection of the last two samples:

SERIES OF MUDDY WATER TESTS BY STATE HEALTH DEPARTMENT AT FIRE HYDRANT ON WILDER STREET NEAR SOUTH SEVENTH STREET, FIRST WARD—OCTOBER 14, 1913.

Sample.	Hour of Collection.	Bacteria per c. c.		
		Total Count.	Pink Colonies.	B. Coli.
No. 1—Tap, 1431 S. 7th Street,	10:55 A. M.,	60	0	0
No. 2—Fire Hydrant,	11:00 A. M.,	2,400	6	2
No. 3—Fire Hydrant,	11:45 A. M.,	900	3	2
No. 4—Fire Hydrant,	12:10 P. M.,	1,200	4	3
No. 5—Fire Hydrant,	12:40 P. M.,	900	6	2
No. 6—Fire Hydrant,	1:09 P. M.,	600	3	1
No. 7—Fire Hydrant,	2:45 P. M.,	900	1	0
No. 8—Fire Hydrant,	3:45 P. M.,	1,500	3	1

Before starting the last series the gate valve on the water main connecting with South Seventh Street was closed so that the supply came from South Sixth Street and the flow from the hydrant was as from the blow-off on a dead end. As this gate valve was being closed a tap sample was collected at 1431 South Seventh Street, in order to have a sample representative of the water flowing in the main before it was agitated by opening the fire hydrant. The results show the tap sample water to be satisfactory. As soon as the hydrant was open muddy water appeared and turbidity persisted throughout the entire test period. When first opened the water was very muddy. The hydrant was kept partly open throughout the test but was opened full just before collecting samples. The results obtained at these two stations in the First Ward are comparable with the results obtained at the other fire hydrants and it is believed that the hydrants tested represent the condition of the water of the mains in general. It appears from the results obtained from the muddy water samples that the mud deposits in the water mains are seeded with bacteria which appear whenever agitation of the water occurs, the number released from this deposit being proportionate to the agitation. The samples from the hydrants showed a larger number of bacteria than were found in samples collected from the sampling stations established throughout the Torresdale district. The entire district, however, showed the effect of the flushing of the mains except in a few cases where the sampling stations were located on one of the large distributors.

The water supply for the First Ward is obtained from a sixteen inch main coming direct from the forty-eight inch main on Broad Street and from a sixteen inch main running north and south through the ward connecting with the twenty inch main on the north coming direct from the forty-eight inch main and with an extension from the forty-eight inch main on the south. Regular city sampling

Stations Nos. 22 and 24 probably obtained their supply from the sixteen inch main connected direct with the forty-eight inch main. Regular city Station No. 27 was more isolated than the others and was probably fed by small laterals. This possibly accounts for the larger total count and the greater number of B. Coli found at this station. The results obtained by the State Health Department at city special Station No. 82 showed a high total count and the presence of B. Coli during October as was the case with other stations sampled by the State during October.

The First Ward lies directly south of the Second Ward, extending south from Wharton Street to Mifflin Street, a distance of six blocks and west from the Delaware River to Passyunk Avenue. In the northern half of the ward bad housing conditions are encountered. The entire ward is congested and many nationalities are found therein. It is partly unsewered, a condition which increases the chance of neighborhood infection. Several groups of cases were found but for the most part they were scattered in the territory lying west of South Front Street. There does not seem to be any predominance of cases in the northern part of the ward, where the bad housing conditions are found, over the southern half.

Directly along the river front are a number of industrial plants but the only dual pipe connection was in the plant of the N. G. Taylor Company, tin-plate manufacturers, located at the corner of Tasker and Swanson Streets, one-third of a mile back from the river. At this works there was a four inch connection to the city main from a pipe line through which water from an artesian well was piped to a tank. On July 30th, 1913, the company put in a drip and the latter part of September there was an absolute severance of the dual pipe connection.

The city and the State had sampling Station No. 82 at South Front and Tasker Streets, but this was not used until October after the dual pipe connection had been severed. Consequently, no data are available to show what effect, if any, may have been produced on the quality of the city water by this dual pipe connection.

In the first ten months of 1913, eighty cases of typhoid fever occurred in the First Ward, sixty-seven of which were reinvestigated by the city's medical inspector at the request of the State Department of Health. This reinvestigation, however, failed to shed much additional light on the sources of infection as only thirteen of the eighty cases can be assigned to specific origins. The causes assigned are shown in the following table:

Imported,	3	Drank river water,	1
Secondary,	3	Contact at work,	1
Not typhoid,	1	Stetson's hat factory,	1
Traveled on river steamer,	1		
Worked on river wharf,	2		13

Seven of the sixty-seven unknown cases handed back for reinvestigation had moved and could not be found. In this ward as in the others the inspectors had trouble in securing adequate data as a number of the patients were foreign born, which always adds to the difficulty.

The tables following show the typhoid fever cases in the First Ward for six years, for the entire year and also during the open season from April to October inclusive. The record for this ward is quite similar to that of the Second Ward. In fact there is a marked similarity in the course of typhoid fever in the two wards. Here again the influence of filtered water is to be noted. Most of the fever occurred during the open season, this being especially true of 1913.

TYPHOID FEVER CASES IN THE FIRST WARD FOR SIX YEARS—POPULATION 48,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	31	3	9	1 Lime	1 Lime	6 Lime
February,	34	6	0	0 "	2 "	1 "
March,	16	12 PF.	3	1 "	1 "	1 "
April,	12	3	1	1 "	0 "	4 "
May,	11 F.	2	2	1	3 "	13 "
June,	7	3	2	2	4 "	11 "
July,	9	2	6	0	10 "	16 "
August,	10	16	10	8	14 "	15 "
September,	12	11	12	5	6 "	12 "
October,	5	7	1	3	4 "	1 "
November,	0	6	5	1	4 "	.....
December,	6	2	2 Lime	3 "	2 "	.....
Total,	153	73	53	26	51	80

Typhoid Fever Cases in the First Ward in the Open Season, April to October Inclusive—For Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases, ...	66	44	34	20	41	72

Thirty-Ninth Ward.: In the Thirty-ninth Ward the city maintained regular sampling Station No. 28 and special sampling Stations Nos. 83, 84, 85, 89, 90, and 91. The State Health Department established sampling stations at city special Stations Nos. 84, 89, 91 and a station at League Island Park entrance, where the city did not have a sampling station.

City regular sampling Station No. 28, located at South Sixth Street and Snyder Avenue, was established in June, 1913, and at this station the following results were obtained:

RESULTS OF ANALYSES OF WATER SAMPLES FROM CITY REGULAR STATION NO. 28—THIRTY-NINTH WARD—1913.

Day.	June.			July.			August.			September.			October.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
1	.....	.....	.....	.....	.....	.....	96	—	+	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	70	+	+	.....	.....	.....	84	+	+	.....	.....	.....
3	.....	.....	.....	.....	.....	.....	88	+	+	37	—	+	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	.....	.....	.....	40	—	—	160	—	+	.....	.....	.....	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	.....	.....	.....	50	—	—	36	—	—	.....	.....	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	35	—	+	.....	.....	.....
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	90	—	+	180	+	+	9	—	+	35	—	—	.....	.....	.....
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	25	—	+	.....	.....	.....	90	—	—	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	20	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
14	.....	.....	.....	.....	.....	.....	20	—	+	.....	.....	.....	.....	.....	.....
15	45	+	+	250	+	+	.....	.....	.....	160	—	+	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17	.....	.....	.....	120	+	+	.....	.....	.....	110	+	+	.....	.....	.....
18	230	+	+	.....	.....	.....	230	—	+	.....	.....	.....	.....	.....	.....
19	700	—	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	.....	.....	.....	93	+	+	110	—	—	.....	.....	.....	.....	.....	.....
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	250	—	+
22	80	—	—	86	—	+	.....	.....	.....	33	+	+	.....	.....	.....
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	20	+	+	22	+	+	.....	.....	.....	98	—	+	.....	.....	.....
25	.....	.....	.....	.....	.....	.....	19	+	+	.....	.....	.....	.....	.....	.....
26	13	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	.....	.....	.....	110	—	+	12	—	+	.....	.....	.....	110	+	+
28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	25	+	+	86	+	+	.....	.....	.....	390	+	+	34	—	—
30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Special Station No. 83 is located at South Front and Mifflin Streets; No. 84 at South Second and Wolf Streets; No. 85 at South Fifth Street and Snyder Avenue; No. 89 at Passyunk Avenue and Mifflin Street; No. 90 at South Broad and Ritner Streets; No. 91 at South Broad and Oregon Streets.

The results obtained by the city at these six special sampling stations are shown in the following table:

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NOS. 83, 84, AND 85 DURING OCTOBER, 1913.

October.	Station No. 83.			Station No. 84.			Station No. 85.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	190	+	+	320	+	+	140	+	+
6,	51	−	+	44	−	+	91	−	+
8,	1,000	+	+	260	+	+	170	−	+
10,	130	−	+	150	−	+	110	+	+
13,	170	+	+	170	+	+	110	−	+
15,	32	−	+	87	+	+	65	+	+
17,	94	−	+	34	−	−	300	+	+
20,	19	−	+	12	−	−	12	−	−

RESULTS OF ANALYSES OF WATER SAMPLES COLLECTED AT CITY SPECIAL STATIONS NOS. 89, 90, AND 91 DURING OCTOBER, 1913.

October.	Station No. 89.			Station No. 90.			Station No. 91.		
	Total Count.	B. Coli.		Total Count.	B. Coli.		Total Count.	B. Coli.	
		1 c. c.	10 c. c.		1 c. c.	10 c. c.		1 c. c.	10 c. c.
2,	120	−	+	96	−	+	170	+	+
6,	160	+	+	110	+	+	63	−	+
8,	370	+	+	280	+	+	83	+	+
10,	130	−	+	120	−	+	95	−	−
13,	72	−	+	100	+	+	62	−	−
15,	110	+	+	130	+	+	51	−	+
17,	220	+	+	250	+	+	110	−	+
20,	20	−	+	17	−	+	37	−	+

The results obtained by the city at its regular and special sampling stations in this ward show that B. Coli were present in a large number of the samples, appearing more frequently than in the two wards north. There was also a noticeable reduction in the total counts and B. Coli obtained at the six special stations on October 20th.

The results obtained by the State Health Department at city sampling Stations Nos. 84, 89, and 91 and at the State's station at League Island Park appear in the following tables:

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU SPECIAL STATION NO. 84—SOUTH SECOND AND WOLF STREETS, THIRTY-NINTH WARD—1913.

Day.	October.			November.			December.		
	Bacteria per c. c.			Bacteria per c. c.			Bacteria per c. c.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	40	0	0	40	0	0
2,	.....	.....	.....	21	0	0	24	0	0
3,	.....	.....	.....	13	0	0	40	0	0
4,	.....	.....	.....	—	—	—	16	0	0
5,	.....	.....	.....	7	0	0	12	0	0
6,	.....	.....	.....	14	1	0	15	0	0
7,	.....	.....	.....	32	0	0	—	—	—
8,	.....	.....	.....	26	0	0	16	0	0
9,	240	1	0	220	1	0	12	0	0
10,	650	2	1	300	4	2	120	0	0
11,	600	2	0	50	0	0	7	0	0
12,	250	3	1	48	0	0	19	0	0
13,	450	2	1	50	0	0	8	0	0
14,	—	—	—	60	0	0	—	—	—
15,	150	0	0	46	1	0	.....	.....	.....
16,	1,000	4	3	50	0	0	.....	.....	.....
17,	600	1	0	28	0	0	.....	.....	.....
18,	900	12	4	12	0	0	.....	.....	.....
19,	250	2	2	8	0	0	.....	.....	.....
20,	60	0	0	12	0	0	.....	.....	.....
21,	200	0	0	21	0	0	.....	.....	.....
22,	25	0	0	17	0	0	.....	.....	.....
23,	50	1	1	29	0	0	.....	.....	.....
24,	40	1	0	22	0	0	.....	.....	.....
25,	—	—	—	7	0	0	.....	.....	.....
26,	—	—	—	24	1	1	.....	.....	.....
27,	31	0	0	—	—	—	.....	.....	.....
28,	100	0	0	24	0	0	.....	.....	.....
29,	60	0	0	39	1	0	.....	.....	.....
30,	45	1	1	100	0	0	.....	.....	.....
31,	80	1	1	.....	.....	.....	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU STATION NO. 89, PASSYUNK AVENUE AND MIFFLIN STREET, THIRTY-NINTH WARD—1913.

October 1913.	Bacteria per Cubic Centimeter.		
	Total.	Pink Col.	B. Coli.
10,	350	0	0
11,	350	1	0
12,	250	0	0
13,	100	0	0
14,	—	—	—
15,	200	1	1
16,	150	0	0
17,	450	4	3
18,	—	—	—
19,	250	2	0
20,	60	0	0
21,	70	0	0
22,	130	2	2

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT CITY WATER BUREAU SPECIAL STATION NO. 91, BROAD AND OREGON STREETS, THIRTY-NINTH WARD—1913.

Day.	October.			November.			December.		
	Bacteria per c. c.			Bacteria per c. c.			Bacteria per c. c.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	18	0	0	38	0	0
2,	.....	.....	.....	66	0	0	40	0	0
3,	.....	.....	.....	18	2	2	28	0	0
4,	.....	.....	.....	—	—	—	8	0	0
5,	.....	.....	.....	16	0	0	6	0	0
6,	.....	.....	.....	21	0	0	18	0	0
7,	.....	.....	.....	20	0	0	—	—	—
8,	.....	.....	.....	19	0	0	20	0	0
9,	.....	.....	.....	200	4	3	20	0	0
10,	500	0	0	250	1	1	36	0	0
11,	350	1	0	120	0	0	24	0	0
12,	400	2	1	56	0	0	8	0	0
13,	250	2	1	51	0	0	10	0	0
14,	—	—	—	40	1	1	.....	.....	.....
15,	600	6	2	45	1	0	.....	.....	.....
16,	900	4	3	48	0	0	.....	.....	.....
17,	900	4	0	90	0	0	.....	.....	.....
18,	600	15	5	12	0	0	.....	.....	.....
19,	200	0	0	20	0	0	.....	.....	.....
20,	80	1	0	30	0	0	.....	.....	.....
21,	—	—	—	22	0	0	.....	.....	.....
22,	—	—	—	17	0	0	.....	.....	.....
23,	25	0	0	50	0	0	.....	.....	.....
24,	40	0	0	11	0	0	.....	.....	.....
25,	—	—	—	6	0	0	.....	.....	.....
26,	—	—	—	13	0	0	.....	.....	.....
27,	20	0	0	—	—	—	.....	.....	.....
28,	42	0	0	28	0	0	.....	.....	.....
29,	120	0	0	26	1	1	.....	.....	.....
30,	28	0	0	20	0	0	.....	.....	.....
31,	19	0	0	.....	.....	.....	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT LEAGUE ISLAND PARK ENTRANCE, THIRTY-NINTH WARD—1913.

Day.	October.			November.			December.		
	Bacteria per c. c.			Bacteria per c. c.			Bacteria per c. c.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
1,	.....	.....	.....	44	0	0	42	0	0
2,	.....	.....	.....	28	0	0	25	0	0
3,	.....	.....	.....	21	0	0	50	0	0
4,	.....	.....	.....	—	—	—	16	0	0
5,	.....	.....	.....	100	0	0	20	0	0
6,	.....	.....	.....	34	0	0	16	0	0
7,	.....	.....	.....	44	0	0	—	—	—
8,	.....	.....	.....	46	2	1	100	0	0
9,	.....	.....	.....	38	0	0	16	0	0
10,	300	1	0	48	0	0	10	0	0
11,	300	0	0	60	0	0	13	0	0
12,	240	2	2	32	0	0	28	0	0
13,	40	0	0	52	0	0	7	0	0
14,	—	—	—	48	0	0	.....	.....	.....
15,	140	1	0	28	1	0	.....	.....	.....
16,	125	0	0	72	0	0	.....	.....	.....
17,	500	0	0	15	0	0	.....	.....	.....
18,	200	2	1	10	0	0	.....	.....	.....
19,	250	2	2	15	0	0	.....	.....	.....

STATE DEPARTMENT OF HEALTH ANALYSES OF SAMPLES COLLECTED AT LEAGUE ISLAND PARK ENTRANCE, THIRTY-NINTH WARD—1913—Continued.

Day.	October.			November.			December.		
	Bacteria per c. c.			Bacteria per c. c.			Bacteria per c. c.		
	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.	Total Count.	Pink Col.	B. Coli.
20,	500	2	1	6	0	0	.....	.....	.....
21,	—	—	—	—	—	—	.....	.....	.....
22,	—	—	—	30	0	0	.....	.....	.....
23,	80	0	0	18	0	0	.....	.....	.....
24,	80	2	1	21	0	0	.....	.....	.....
25,	—	—	—	30	0	0	.....	.....	.....
26,	—	—	—	30	0	0	.....	.....	.....
27,	—	—	—	—	—	—	.....	.....	.....
28,	150	0	0	15	0	0	.....	.....	.....
29,	80	0	0	27	0	0	.....	.....	.....
30,	72	1	0	400	0	0	.....	.....	.....
31,	89	2	1	.....	.....	.....	.....	.....	.....

The results obtained at city regular Station No. 28 are similar to those from the regular stations in the First Ward, although it will be noticed that the counts as a whole are a little higher and B. Coli appear more frequently. Station No. 28, at the corner of South Sixth Street and Snyder Avenue, is on a sixteen inch main coming direct from the twenty inch main on Broad Street, which is an extension of the forty-eight inch main on Broad Street. Water reaching this point has travelled a great distance and higher total counts would be expected than from samples collected from stations on the large express main or near Lardner's Point. The whole of the Thirty-ninth Ward is supplied by relatively small water mains. Special sampling Station No 84, at the corner of Wolf and South Second Streets, shows the character of the water in small mains in this ward. Here the total count remained a little higher than in Stations Nos. 89 and 91 and the Pink and B. Coli Colonies are more persistent, and are found more frequently in November than was true at other stations, except at Station No 91. The samples at League Island Park were obtained at the entrance building and the water was from a twelve inch main, which is an extension of the twenty inch main terminating on Broad Street at Shunk Street. This sampling station was established to show the character of the water after it had passed the entire length of the city and had reached what may be practically termed a dead end, as League Island Park is the last consumer on this main.

The October results are similar to those obtained at other stations throughout this district and it is believed the cause is the same.

The Thirty-ninth Ward lies directly south of the First Ward and extends to League Island. It covers considerable area, only about one-third of which is built up, the territory below Oregon Avenue being given over to farms and there is considerable marsh land. The Delaware River front in this ward has been developed farther south than Oregon Avenue and notable among the industrial activities along the river in the southern part of the ward are the Greenwich Point coal piers in the vicinity of Packer Street. While the entire ward has been laid out, yet in the southern part the streets are not developed and it is open country.

During the year 1913, up to the first of November, a hundred and seventeen cases of typhoid fever occurred in the Thirty-ninth Ward. These cases are mostly to be found in the northern part of the ward in the territory between McKean Street on the north and Porter Street on the south, and extending from South Third Street west to South Twelfth Street, this area comprising a very small section of the ward. Ten well defined groups of cases occur, with a total of seventy-three cases thus located. These groups comprise from four to ten cases each, one group of seven cases having five in one household This grouping directs attention to the possibility of neighborhood infection which has not been proven conclusively, although eighty-eight of the hundred and seventeen cases were returned to the city medical inspectors for reinvestigation, but without producing any marked results. There are no dual pipe connections in this ward. In the southern part of the ward are to be found piggeries and some poudrette pits, details of which will be discussed later on.

The Greenwich Point coal piers—piers Nos. 106 to 111 inclusive—are owned and operated by the Pennsylvania Railroad Company. Five hundred men are employed here, to supply fuel to steamships and load coal for transportation. There are no dwellings in the vicinity and no city water, the only water supply coming from the Delaware River. Raw river water is used for all purposes except

in the office where melted ice furnishes a drinking water supply. It is pumped into the fire mains on the piers and into the water tanks, from which the supply goes to the locomotives and to the steam boilers connected with the hoisting machinery. Taps are placed on the pipe lines and the men drink the water drawn from these faucets. No water is furnished from the piers to any vessel. Several cases of typhoid fever occurred among the workmen on the piers, some of whom lived in wards other than the Thirty-ninth.

Causes of infection have been assigned to thirty-three cases, leaving eighty-four undetermined, of which number seventy-two are of unknown origin and the remaining twelve could not be reinvestigated for various reasons. In the following list are shown the causes assigned to the thirty-three cases with determined sources of infection:

Imported,	3	Worked along river,	3
Secondary,	18	Drank river water,	2
Contact,	3	Doubtful diagnosis,	1
Travelled on Delaware River,	1		
Bathed in river,	1		
Bathed in ponds,	1	Total,	33

In the following tables are shown the cases of typhoid fever in the Thirty-ninth Ward for six years. This is similar to those of the other wards in this district, showing a falling off in cases after the introduction of filtered water, with a rise in 1913. As in the other wards a majority of the cases occurred during the open season. After the introduction of hypochlorite of lime the number of cases decreased, except in 1913.

TYPHOID FEVER CASES IN THE THIRTY-NINTH WARD FOR SIX YEARS, POPULATION 54,000.

Mouth.	1908.	1909.	1910.	1911.	1912.	1913.
January,	25	6	15	4 Lime	4 Lime	4 Lime
February,	39	10	5	2 "	1 "	3 "
March,	26	3 PF.	5	0 "	1 "	1 "
April,	36	6	5	0 "	0 "	7 "
May,	10 F.	13	2	0	2 "	16 "
June,	5	5	4	0	3 "	14 "
July,	10	9	2	2	5 "	23 "
August,	6	10	8	8	11 "	31 "
September,	14	9	8	8	7 "	13 "
October,	13	8	9	3	5 "	5 "
November,	3	0	2	2	5 "	.....
December,	7	3	1 Lime	2 Lime	0 "	.....
Total,	194	82	66	31	44	117

Typhoid Fever Cases in the Thirty-ninth Ward During the Open Season—April to October, Inclusive—for Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	94	60	38	21	33	109

Thirtieth Ward: With the Thirty-ninth Ward there is concluded the study of typhoid fever for the eastern half of the South Philadelphia district. The remainder comprises wards Thirty, Thirty-six, and Twenty-six, the first two flanking the Schuylkill River and the Twenty-sixth lying just west of Broad Street. The Thirtieth Ward is the most northerly of the three, bounded on the north by South Street, on the south by Washington Avenue and extending westerly from South Broad Street to the Schuylkill River. It is largely residential except along the river where industries are located. These three wards are furnished with Torresdale water but no sampling stations were maintained in any of them.

In the Thirtieth Ward there were two dual pipe connections, one at the power house at the Philadelphia Electric Company, corner of Grays Ferry Road and Carpenter Street, and the other at the plant of W. K. Mitchell & Company, 2940 Ellsworth Street. At the first named there was a four inch valved connection between the system through which river water was pumped around the plant to the fire lines and heaters and the city water supply but on September 22nd, 1913 this was disconnected.

At the W. K. Mitchell & Company's plant the dual connection existed between a supply of well water and the city main. This was two inches in diameter and was supplied with two gate valves. On September 12th, 1913, this dual connection was severed.

There has been a marked reduction in cases of typhoid fever in the Thirtieth Ward since 1908, when a hundred and twenty-seven cases occurred. The next year the cases dropped to forty-seven, with a material reduction in each of the next three years, the low year being 1912, with only nine cases. In 1913, there were seventeen cases making this the second lowest of the six years. In this ward the effect of the introduction of filtered water is well demonstrated by the reduction in the occurrence of the disease and the use of hypochlorite of lime appears to have been followed by good results. The seventeen cases for 1913 are scattered generally throughout the ward. Eight of the seventeen of unknown origin and the nine assigned causes comprise two imported cases, one secondary, and six river bathers. The tables showing the cases for six years follow:

TYPHOID FEVER CASES IN THE THIRTIETH WARD FOR SIX YEARS, POPULATION 29,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	28	5	0	2 Lime	0 Lime	0 Lime
February,	30	8	3	1 "	0 "	3 "
March,	19	6 PF.	0	1 "	1 "	1 "
April,	12	3	0	0 "	0 "	0 "
May,	10 F.	6	0	0	2 "	0 "
June,	4	0	1	1	0 "	4 "
July,	3	0	2	4	1 "	3 "
August,	6	5	4	3	1 "	5 "
September,	3	6	8	3	2 "	1 "
October,	3	4	4	2	2 "	0 "
November,	2	1	1	0	0 "	.....
December,	7	3	4 Lime	4 Lime	0 "	.....
Total,	127	47	27	21	9	17

Typhoid Fever Cases During the Open Season—April to October, Inclusive—for Six Years—Thirtieth Ward.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	41	24	19	13	8	13

Thirty-sixth Ward: The Thirty-sixth Ward extends along the remainder of the Schuylkill River water front in the South Philadelphia district all the way to League Island, and from South Eighteenth Street west to the river. It is extensive in area and like the Thirty-ninth Ward is not thickly settled south of Oregon Avenue, which extends about midway through the Thirty-sixth Ward. Below this thoroughfare are found truck farms, piggeries, poudrette pits, and marsh lands, with some industries along the river front. The typhoid fever cases for 1913 are practically all located north of Oregon Avenue.

This ward was not supplied with any sampling station. Two dual pipe connections were found. One was in the plant of the Philadelphia Rubber Works, South Thirty-seventh and Reed Streets, just north of the Baltimore and Ohio Railroad. One hundred and twenty-five men are employed. City water is used for drinking purposes, and raw river water is filtered and used for fire and industrial purposes.

Spring water is furnished in the office. Prior to September 4th, 1913, there was a one inch pipe connection for priming purposes, between the city mains and the centrifugal pumps used to raise the river water. On this date it was disconnected.

The other dual pipe connection was located in the shops of the Baltimore and Ohio Railroad at South Thirty-eighth and Jackson Streets. There were two pumps here raising the river water to three tanks, thence to the fire line. The river water was filtered for boiler purposes, and the city water used for drinking and for an emergency boiler feel. There was a three inch connection with a closed valve and a check valve between the two systems. On Septembed 22nd, 1913, this was abolished.

In 1913, up to the first of November, eighty-four cases of typhoid fever occurred in the Thirty-sixth Ward. These were located in the northern part of the ward mostly east of South Twenty-fifth Street. Thirty-three of the cases were returned to the city medical inspector for re-investigation. The origin of twenty-seven of the cases has been determined, including three laborers at the Greenwich Coal Piers, located in the Thirty-ninth Ward. These determined causes are as follows:

Imported,	7
Secondary,	7
River bather,	5
Infected at work,	5
Greenwich pier laborers,	3
Total,	27

This leaves fifty-seven cases undetermined, three of which could not be located on re-investigation.

After the year 1908, when filtered water was introduced into this ward, there was a remarkable falling off in typhoid fever in 1909. It was reduced still further the following year, reaching the lowest mark in 1911 when but twenty-one cases occurred, the decrease being possibly due to the use of hypochlorite of lime at Torresdale. The year of 1911, however, has been uniformly low in typhoid fever throughout the whole Central and South Philadelphia district. In 1912 the cases increased to sixty-three and for the first ten months of 1913 there were eighty-four cases. These facts are shown in the following tables:

TYPHOID FEVER CASES IN THE THIRTY-SIXTH WARD FOR SIX YEARS, POPULATION 61,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	54	17	6	2 Lime	6 Lime	4 Lime
February,	64	24	6	1 "	5 "	1 "
March,	30	8 PF.	4	1 "	2 "	3 "
April,	44	6	3	0 "	1 "	7 "
May,	17 F.	12	2	0	3 "	10 "
June,	11	6	4	1	4 "	10 "
July,	9	4	1	4	9 "	20 "
August,	22	9	11	3	11 "	16 "
September,	22	7	10	3	13 "	12 "
October,	9	6	9	2	8 "	1 "
November,	14	3	3	0	1 "	.....
December,	13	7	3 Lime	4 Lime	0 "	.....
Total,	309	109	62	21	63	84

The cases occurring in the six years during the open season—April to October inclusive—show a reduction and then an increase, as do the cases for the entire year. This table follows:

Typhoid Fever Cases During the Open Season for Six Years—Thirty-sixth Ward.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	134	50	40	13	49	76

Twenty-sixth Ward: The Twenty-sixth Ward is the last of the wards making up the South Philadelphia District. It forms a tongue shaped territory lying between South Broad Street and Passyunk Avenue on the east and South Eighteenth Street on the west, extending south from Washington Avenue to League Island, the same length north and south as the Thirty-sixth Ward. From McKean Street south, this ward is only four blocks wide. North of McKean Street it widens and has a maximum width of eleven blocks along its northern edge. It too, like the Thirty-sixth and Thirty-ninth Wards, is built up to the north of Oregon Avenue; south of here lies the open country. The settled portion of the ward is rather densely populated, the section immediately abutting South Broad Street built up with a good type of residences, while away from this main thoroughfare the dwellings are generally inferior. There were no dual pipe connections in this ward, in fact there are few industries of any kind.

The Tweny-sixth Ward lies directly along the Broad Street express main and thus should get fresh Lardner's Point water. There were no sampling stations in the Twenty-sixth Ward but both the city and the State maintained stations along the express main directly over the line in the Thirty-ninth Ward and the results obtained from them have been set forth above.

Typhoid fever for ten months in 1913 more than doubled over the preceding year, which was a trifle higher than the year 1911, which year in this ward as well as the other wards in the district was the lowest for the six year period studied. After filtered water was introduced in 1908 there was a continued reduction in typhoid fever cases for the next three years. The open season cases reach their greatest number for the six year period in 1913. These facts are shown in the following table:

TYPHOID FEVER CASES IN THE TWENTY-SIXTH WARD FOR SIX YEARS—POPULATION 55,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	28	3	17	0 Lime	2 Lime	5 Lime
February,	36	19	10	3 "	2 "	1 "
March,	22	11 PF.	1	3 "	3 "	1 "
April,	28	4	3	5 "	1 "	12 "
May,	14 F.	3	2	1	2 "	19 "
June,	5	1	2	3	3 "	10 "
July,	14	7	1	3	11 "	18 "
August,	18	10	4	5	13 "	20 "
September,	11	8	7	8	7 "	20 "
October,	8	6	19	3	5 "	11 "
November,	3	2	3	4	4 "	.....
December,	6	14	4 Lime	5 "	2 "	.....
Total,	194	88	73	43	55	117

Typhoid Fever Cases During the Open Season—April to October, Inclusive—for Six Years—Twenty-sixth Ward.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	98	39	38	28	42	110

Very unsatisfactory results were obtained from the records of investigation of the cases in this ward in 1913. Fifty-eight of the cases were returned to the city medical inspectors to be re-investigated but this did not yield any material results. A careful study of the data available enabled the State to determine causes for but twenty-seven of the hundred and seventeen cases. This leaves ninety cases of

undetermined origin, nine of which could not be re-investigated for various reasons and eighty-one are definitely classed as unknown. The determined causes are shown below:

Imported,	9	River water,	1
Secondary,	12	River water infection,	1
Contact,	2		
Stetson Hat Factory,	2		
River bather,	1		27

Almost the entire Central and Southern district is supplied with water from two forty-eight inch express mains bringing water fresh from Lardner's Point. The sampling stations on these large mains show a better water than on branches from these mains. When the water is carried a great distance and distributed through small mains the total counts are higher and pink and B. Coli colonies appear more frequently. The difference between results obtained at sampling stations on large mains and sampling stations on small mains can hardly be attributed to dual connections. Sediment in the mains appears to be the explanation in most cases. The results of muddy water samples from fire hydrants show conclusively that the mud in the mains is rich in bacterial life and contains a relatively large number of B. Coli. The flushing of mains late in September and early in October, 1913, certainly stirred the deposit in the mains and as the sediment contained more bacteria than the water from the pump station it would be expected that the bacterial count would increase during the flushing of the mains and return to normal shortly after flushing stopped. The results show that about ten days after flushing was stopped on October 14th, 1913, the total counts returned to normal and B. Coli disappeared except in the case of a few stations that were on small mains at a distance from the large distributors where the effect of flushing did not disappear until November.

A careful study of the occurrence of typhoid fever in this district has been made but owing to inadequate data available for this purpose the results obtained cannot be said to be entirely satisfactory. In many instances no doubt the facts were difficult to procure because of the various nationalities encountered, this district containing many foreigners; furthermore many of the cases could not be reinvestigated because families had moved leaving no definite trace of their whereabouts. The data on each case were carefully studied by the State Health officials and a large number of them were referred to the city medical inspectors for reinspection but this, taken as a whole, did not produce any material results.

While each case was studied individually as to its own particular history and its relation to the community, the outbreak was looked at from other angles of a more general nature. Consequently the milk supply was examined in considerable detail for the entire city, but more particularly for the southern section, for reasons that will be adduced later. The question of vegetable food supplies, necessitating a careful study of the truck farms most numerous in the southern section of the city, was carefully looked into. In this district also abound the piggeries and poudrette pits, for a long time a bone of contention between the city health authorities and the owners. These have been investigated. Vital subjects in an outbreak of a communicable disease are the housing question and the drainage problem, and the State Health officials have secured data relating to these subjects. Detailed facts respecting these various pertinent subjects are on file in the office of the State Department of Health and for the purposes of this report a brief résumé of the situation is given.

MILK SUPPLY.

Data relative to the milk supply of each case for the entire city were secured and a special study was made with a view to determining whether the infection might not have been transmitted through the medium of drivers on the various milk routes. It developed that throughout the city generally there were many supplies but that in South Philadelphia there were two large dealers serving many cases in this district, consequently a detailed study of the milk supply in this lower part of the city was made.

The dealer supplying each case of typhoid fever was ascertained, a summary of the number of cases supplied by each dealer being given in the table following. It will be observed that two of the dealers served a large number of the cases, and four other dealers together served a considerable number. For convenience the dealers will be designated by letters. Dealers "A" and "B" served 236 and 102 cases respectively, and it was found that practically all of these cases occurred in the southern part of the city in the wards below South Street. It was also ascertained that these two dealers had very extensive businesses, the customers

running into the thousands, but almost wholly confined to the southern district. Dealer "C" supplied ninety-eight cases; "D" seventy-seven cases; "E" seventy-five cases; "F" seventy-two cases; no other dealer served more than thirty-six cases. The territory in which the last four mentioned dealers supplied milk covered in each case a large portion of the city there being comparatively few cases in each of the many wards, thus included. These dealers include some of the most extensive distributors of milk in the city and, considering the large number of customers supplied by each, the number of typhoid cases served by each is not necessarily significant.

The cases were very widely distributed throughout the city except in the cases of dealers "A" and "B." These two dealers covered the entire area below South Street very thoroughly, each dividing the district into small sections in which individual drivers served milk to many customers, between them supplying the greater part of the population resident here.

SUMMARY OF MILK SUPPLIES TO TYPHOID CASES IN THE ENTIRE CITY—1913—JANUARY TO OCTOBER INCLUSIVE.

Number of Dealers.	Cases Served by Each Dealer.	Total Cases Served.
1,	Over 200,	236
1,	101 to 200,	102
2,	76 to 100,	175
2,	51 to 75	147
6,	21 to 50,	155
5,	11 to 20,	62
11,	5 to 10,	69
7,	4,	28
25,	3,	75
44,	2,	88
176,	1,	176
280 Dealers.		1,313

Of the remaining 216 cases, fifty-seven used no milk and the remainder had unknown supplies, used condensed milk or obtained milk from their own cows or from "various" sources.

The prevailing conditions did not point toward milk as an important means of transmitting the infection generally throughout the city, but the strongest possibility of such transmission seemed to lie in the district south of South Street and, therefore, a detailed study was made of the routes of the two important dealers in this area.

Between January 1st and October 15th, 1913, approximately five hundred cases of typhoid fever were reported from this area which comprises wards Nos. 1, 2, 3, 4, 26, 30, 36, and 39. About sixty per cent. of these cases were served by the ninety-five milk wagon drivers of dealers "A" and "B" whose routes were studied in detail. This study included ascertaining whether typhoid fever occurred among the drivers employed on these routes during this period, or at the homes of any of them, the order in which the customers were served on each route, and the date of onset of each case of typhoid fever among the customers; the possibility of transfer of infection from one house to another along each route, and all other pertinent information available.

Two drivers were victims of typhoid and a third lived in a house where typhoid occurred, but on none of the routes was there found evidence of probable infection from the drivers. The possibility of infection by transfer along the routes occurred in a hundred and thirteen cases, twenty-three per cent. of the total cases in the district and thirty-five per cent. of the customers served along the routes studied. The evidence points, however, to the conclusion that few, if any, of these hundred and thirteen cases are attributable to infection from milk or milk containers.

Dealer "A" serves 27,000 customers on sixty-three milk routes in this district including 219 cases of typhoid fever. Dealer "B" serves 10,100 customers on thirty-two milk routes in this district including a hundred and seven cases of typhoid fever. Some of the cases received milk from both dealers, or some of the cases received milk from various or unknown supplies and for the purpose of this study these cases were all supposed to have received milk from both "A" and "B." There were nineteen cases of this kind.

Among all the drivers employed since January 1st, 1913, on the ninety-five milk routes studied, it was ascertained that only three lived in houses where typhoid fever occurred. Two of these drivers were themselves victims of typhoid fever. L. B., a driver of "A," route No. 25, and Wm. M., a driver of "B" route No. 10; P. S., driver of "B" route No. 10 and later route No. 25, lived in the same house with Wm. M., but did not have the fever.

Driver L. B., thirty-eight years old, lived at 1947 South Twenty-third Street, was taken sick with typhoid fever on August 1st, 1913, and went to bed on August 8th He stopped serving milk on "A" route No. 25 on August 1st. There were four cases among 420 customers served along this route. The dates of onset were April 10th, June 10th, August 13th, and August 20th respectively. It is possible that the last two might have been infected by this driver. In the order of customers served the first of the four cases was that of August 20th, prior to which time milk had been delivered each day to 224 customers and 196 subsequently. The second case in order along the route was that of August 13th, prior to which 304 customers had been served and 116 subsequently. The third and fourth cases were those of April 10th and June 10th respectively. If the two cases in August were to be attributed to infection due to carelessness on the part of the driver, it is remarkable that there were not more cases along the route. Negative bacteriological results were obtained on L. B. on September 23rd and 26th respectively by the city bacteriologist and consequently he was allowed to return to work on October 1st, 1913.

Wm. M., 1810 South Hicks Street, age seventeen, was the driver on "B" route No. 10 from September 4th, 1913, to October 16th, 1913. He had typhoid fever prior to his employment on the milk route. He was taken ill on July 7th and went to bed on July 14th and was removed to the Methodist Episcopal Hospital. He had previously been employed as a meter maker. Among 225 customers on this route only one case of typhoid fever occurred, the onset being February 1st.

P. S., of 1810 South Hicks Street, where Mr. M. also lived, was driver of "B" route No. 10 from August 1st, 1912, to August 7th, 1913, and was then transferred to "B" route No. 25. He did not have typhoid fever but at home was presumably exposed to the Wm. M. case prior to July 14th when M. took to bed. No cases of typhoid fever occurred on route No. 10 after July 14th or indeed after February 1st, and among the 324 customers on route No. 25 served by P. S. after August 7th, 1913, only one case of typhoid fever occurred and the onset of it was October 7th.

It appears from the above that the cases of typhoid fever among the drivers of the milk routes or at their homes had no general influence on the occurrence of typhoid fever in the district. As to the possibility of prior infection of the milk the cases are so distributed as to time and locality that no suspicion of either supply is warranted.

The chance of transfer of infection from one house to another along the ninety-five milk routes has been carefully studied. Out of the two hundred cases served by Dealer "A" and nineteen more cases which may have received "A" milk, making a total of 219 cases, only a hundred and ten or fifty per cent. were so located along the routes and had such dates of onset as to make them possibly subject to such infection. Similarly on the "B" routes there were a hundred and seven cases served, including the nineteen possibly served, and forty-five cases or forty-two per cent. were possibly subject to such infection. The number of cases of this kind and the number of routes on which they occurred is shown in the following table:

TABLE SHOWING TYPHOID FEVER CASES—SOUTH PHILADELPHIA—SUBJECT TO POSSIBLE MILK INFECTION BY TRANSFER ALONG MILK ROUTES.

Number of routes.		Cases subject to possible infection by transfer along the route.	Total Cases.	
		Dealer "A."		
1		8	8	
4		4	24	
2		5	10	
7		4	28	
3		3	9	
9		2	18	
13		1	13	
24	63	0	0	110
		Dealer "B."		
2		6	12	
1		5	5	
1		4	4	
2		3	6	
6		2	12	
6		1	6	
14	32	0	0	45
Total, ..	95		Total, ..	155

As shown by this tabulation there are, on the ninety-five routes comprising those of both "A" and "B," a hundred and fifty-five cases to be considered in the study of possible transfer of infection from house to house along the milk routes; sixteen of these cases occurred in the same houses with earlier cases and are considered secondary, leaving a hundred and thirty-nine primary. A further reduction may reasonably be made of twenty-six of these primary cases which occurred more than three months after the case or cases along the route from which the infection has been considered above as possibly transferred; this leaves a hundred and thirteen primary instances of infection possibly due to transfer along milk routes. Of the three hundred and twenty-six total cases served by these two dealers, twenty-two were secondary and three hundred and four were primary cases. The cases possibly transferred comprise thirty-five per cent. of the total number served. The figures are given in the following summarized table:

	Dealer "A"	Dealer "B"	Total.
Primary cases served,	206	98	304
Secondary,	13	9	22
Total,	219	107	326
Primary cases subject to possible transfer prom prior cases along routes,	100	39	139
Secondary,	10	6	16
Total,	110	45	155
Primary cases under three months after prior case along route,	80	33	133
Secondary,	8	6	14
Total,	88	39	127

The city regulations covering the distribution of milk prohibit the refilling of bottles in the wagons. All milk sold by these two dealers is delivered in bottles filled before leaving the milk depots. It is understood and believed that the rules are closely adhered to and that bottles are rarely, if ever, refilled in the wagons. Milk containers at typhoid houses are required to be left and not removed until the house and its contents, including the bottles, have been fumigated and the placard removed from the house. It is possible of course that in some instances these regulations may not have been followed. Had the practice been general many more cases would be expected.

From the detailed consideration which has been given to the question of a relation between the distribution of milk and the occurrence of typhoid fever, as indicated in the previous pages, the reasonable conclusion is reached that very few, if any, of the typhoid fever cases are attributable directly or indirectly to the milk supplies or their distribution.

TRUCK FARMS.

There are in the county of Philadelphia, whose boundary lines are conterminous with those of the city of Philadelphia, two principal districts where truck farming is engaged in with the use of night soil as a fertilizer. The larger district is that known as South Philadelphia or the "neck" in the Twenty-sixth, Thirty-sixth, and Thirty-ninth Wards, which is also the piggery district. The other and smaller district is in Richmond in the Forty-fifth Ward, lying near the Delaware River in the vicinity of the Pennsylvania Railroad River bridge.

The use of night soil as a fertilizer is sanctioned and regulated by the city Bureau of Health. The night soilers, who clean out privy vaults in various outlying sections of the city, are licensed and registered and are supposed to report to the authorities every privy vault cleaned. It is required that the night soil be placed in pits in the ground known as "poudrette pits" which are "located" by the city authorities and usually dug by the night soilers. It is required that lime be mixed with the night soil in these pits and that the compost remain in the pits for some time before being used, but the aging period is not specified. The pits must also be kept in such a condition that they are not a nuisance. It appears, however, that these regulations are not lived up to and that in certain instances night soil has been simply dumped in heaps on the surface of the ground without being treated with lime and in other instances the poudrette pits are full to overflowing. Such disposal of night soil is carried on surreptitiously.

The City Bureau of Health reports about sixty poudrette pits within the city limits, of which number approximately fifty are in South Philadelphia, the others being widely scattered over the north and northwestern sections of the city. Some farms have one pit, others two and three, while still others have none. Several of the pits are owned by the nightsoilers themselves who sell the composted material to various stores for retail trade.

It is customary to fill the poudrette pits with mixed night soil, manure, earth, and lime throughout the year and to distribute this composted material for fertilizing use, plowing it under in the winter or early spring. It is reported, how-

ever, that in some instances the night soil is used as a fertilizer without any preliminary aging or composting. The direct application of the solution of either fresh or composted night soil is said to be practised by some of the truck farmers, particularly to strengthen blighted celery and lettuce. An Act of General Assembly, to become effective September, 1914, prohibits the use of fresh night soil as a fertilizer for vegetables eaten uncooked for human food.

On March 10th, 1913, in response to an application therefor bearing the date of July 24th, 1912, made on behalf of the city of Philadelphia by the Director of the Department of Public Health and Charities of that city, the Commissioner of Health approved plans for the disposal of night soil into the waters of the State. The facts relative thereto and the conclusions reached are herewith quoted:

"To the Director of the Department
of Public Health and Charities,
Philadelphia, Pennsylvania.

"I, Samuel G. Dixon, Commissioner of Health of the Commonwealth of Pennsylvania, do hereby issue a permit to the city of Philadelphia, Pennsylvania, approving plans for the disposal of night soil into the waters of the State in response to an application therefor bearing date of July twenty-fourth, nineteen hundred and twelve, made on behalf of said city by the Director of the Department of Public Health and Charities of said city of Philadelphia.

"It appears that the present method for the disposal of night soil in South Philadelphia is unsanitary for the following reasons:

"1. The poudrette pits form a breeding place for flies and mosquitoes which can carry intestinal disease germs to food stuffs.

"2. The use of the contents of the poudrette pits as fertilizer on truck farms is a menace to the public health.

"3. The poudrette pits cause a nuisance by bad odors.

"The city is proceeding to abandon privy vaults and it is estimated that before nineteen hundred and twenty, all buildings will be connected with the sewer and the necessity for night soil collections will have been obviated. Bearing in mind this fact, it has been determined in comparing different methods as follows:

"1. Incineration and drying while more perfect methods for a temporary project, are too costly.

"2. A municipal poudrette pit would be a satisfactory solution of the problem if properly managed, but would be more costly to construct and operate than the screening and dilution project.

"3. Screening and disposal of the liquified night soil in the waters of the Delaware River is the cheapest and most easily controlled method.

"Considering the temporary nature of any method adopted, the low cost of construction and operation of the station for screening and liquifying the night soil, the city purposes, if the plan be approved:—

"1. That the Snyder Avenue sewer be extended to the line of Delaware Avenue to eliminate the present nuisance of discharging sewage upon the mud flats at that point.

"2. That in the bed of Snyder Avenue at or near the present sewer outlet a screening and liquifying station be built with a storage tank for the discharge of the liquified night soil into that sewer during the ebbing of the Delaware River.

"3. That the Bureau of Health shall maintain and operate such station and require all night soil now being unsanitarily disposed of in South Philadelphia, to be brought to that point for final disposal.

"Along the Delaware River in South Philadelphia and up-stream to the mouth of Frankford Creek at North Philadelphia, there are in the neighborhood of forty docks. Some of these extend from the pier head line back to the bulkhead line. Others are smaller but still form basins of considerable size. Into each docks, at the present time, there are sewers discharging at the bulkhead line. In consequence, the suspended matters in the sewage settle in these quiescent basins and accumulate. In the ferry slips where the waters and deposits are continually stirred up by the motion of the propellers, as evidenced in the way of odors to the senses of those who travel upon the ferries, the accumulations of the sediment is kept suspended intermittently until it is flushed out beyond the pier head into the river, where it is carried away by the velocity of the tides to form deposits elsewhere, probably in the channel; but in many of the docks it takes but a casual investigation to show the great extent of the accumulation of sewage sludge. Some of these deposits are a nuisance now and they will become more of a nuisance as the docks become important and are used more extensively, until in Philadelphia, as in other places, one of two things must be done—either the sewers must be extended out to the pier heads where the deposits will be into the moving waters of the tides, or an intercepting sewer must be constructed to take the dry weather flow of the sewers away from the basins and convey it to some suitable point where the discharge can be successfully accomplished without creating a nuisance or a damage to the navigation interests on the river. Up to the present time, the docks have proven successful catch basins. To extend the sewers to the end of the pier heads would make the channel the place of collection of the sediment instead of the

basins, and it would be strange indeed if this were not opposed by the harbor authorities. A rough calculation has been made that the total cost of extending these forty odd sewers to the pier head would be at least three million dollars. It has also been roughly calculated that the cost of an intercepting sewer would be less than three million dollars. In the interests of public health from a nuisance standpoint, and in the interests of harbor maintenance, it would be eminently proper for the city to give serious consideration to an early planning for and construction of the intercepting sewer and proper disposal of the sewage from the district.

"In view of all the circumstances it has been unanimously agreed by the Governor, Attorney General, and the Commissioner of Health that the interests of the public health will be subserved by approving the proposed night soil station, and I do hereby and herein approve the same, subject to the following conditions and stipulations:

"*First:* That the city shall provide suitable apparatus for the application of hypochlorites of lime to the sewage and night soil at the station and when the plant is built, plans and a description of the plant as built shall be filed in the office of the State Department of Health.

"*Second:* The city shall within a reasonable time make studies and prepare plans and a report on doing away with the nuisance at the docks on the Delaware River caused by the discharge of sewage sediment into said docks and among other methods an intercepting sewer and sewage treatment plant shall be considered and a report with plans shall be submitted to the State Department of Health for approval on or before December first, nineteen hundred and fourteen.

"*Third:* Daily records of the operations at the station shall be kept on blank forms satisfactory to the State Department of Health and copies thereof shall be filed monthly in said Department's office.

"*Fourth:* If at any time a nuisance or menace to the public health is found to exist at the station herein approved, then such remedial measures shall be enforced as the State Department of Health may advise or approve."

At the end of the year 1913, the night soil disposal plant had not been built. The general conclusion to be drawn, respecting the practice of using night soil as a fertilizer, is that it is dangerous under the conditions existing as the regulations governing the practice seem to be insufficient or are not rigidly enforced.

The produce from the truck farms consists of green vegetables such as lettuce, celery, spinach, carrots, parsnips, and some pot herbs used principally by butchers and restaurants for garnishing. No fruits are grown. The farmers haul their produce to various markets throughout the city, selling to commission merchants or at the curb or in the markets. From the South Philadelphia farms most of the produce is sold to the commission merchants at the Dock Street Market. A smaller amount goes to the markets at Vine Street, Spruce Street, Callowhill Street and elsewhere. A number of the South Philadelphia truck farmers frequent a curb market on or near South Street, where the produce is sold almost entirely at wholesale to grocers, hucksters, street venders, hotels, and retail marketers, from whom the truck is procured by the householder. The commission merchants dispose of their produce to similar purchasers.

Sixteen of the principal retail markets in the city were visited by the State Health Department Inspectors. These are scattered throughout the city and are practically all of the same character, selling dairy products, garden truck, fruits, groceries, etc. The garden truck and fruits are handled in the markets both by farmers and dealers, the former coming from Bucks, Montgomery, Delaware, Chester, and Philadelphia counties and from New Jersey. Some of the truck farmers from South Philadelphia and Richmond, who use night soil as a fertilizer, sell in the various markets. Because of the practice in the produce business to buy and sell according to the quality and price of goods the channels of distribution are continually changing and it is well-nigh impossible to trace the destination of the garden truck which has been fertilized with night soil. It is a known fact, however, that at the South Street Curb Market, a considerable quantity of the South Philadelphia truck farm produce is distributed among residents of the southern part of the city. Consequently, vegetables that may have been fertilized with uncomposted night soil may have been a factor causing in the typhoid fever outbreak in this section of the city.

In the following table are shown the data obtained relative to truck farmers in the South Philadelphia District and the Richmond District and also facts relative to sixteen of the retail markets.

	So. Phila	Richmond
Number of truck farmers visited	45	19
Number of truck farmers using night soil	32	15
Number of truck farmers not using night soil	13	4
Number of night soilers known	7	6
Number of poudrette pits	30	22
Approximate number of commission merchants sold to	30	12

Number of truck farmers selling wholesale at curb markets,	21	4
Number of truck farmers selling wholesale at other markets,	0	3
Number of truck farmers selling at retail markets,	5	2
Number of truck farmers said to apply night soil directly to growing plants,	0	3

MARKETS.*

Number of markets visited,	16
Approximate number of truck farmers selling in markets,	525
Approximate number of truck dealers (not farmers),	70
Number of farmers using night soil who sell in market,	11

*Markets are almost entirely of the basket trade type.

PIGGERIES AND POUDRETTE PITS.

The general facts relating to poudrette pits have already been given under the discussion of truck farms. For a considerable time an attempt has been made in the city to drive the piggeries and poudrette pits away from the neighborhood of public schools and dwellings. The Bureau of Health during the present administration has been especially active along this line. Most of the piggeries for whose removal the city officials have been working lie in the southern part of the city below Oregon Avenue, the largest group being in the extreme southeastern section of the Thirty-ninth Ward near the League Island Navy Yard. Because of the alleged nuisance created by the presence of the piggeries in this locality, the officials of the navy yard have made strong representations to the city authorities.

The Bureau of Health in September, 1913, prepared a map of South Philadelphia, including parts of the Twenty-sixth, Thirty-sixth, and Thirty-ninth Ward showing the location of piggeries and poudrette pits. According to this map there are three distinct groups; a large one in the southeastern section of the Thirty-ninth Ward, south of Oregon Avenue and east of Eleventh Street, where there are five poudrette pits and eighty-eight piggeries; another in the southwestern corner of the Thirty-sixth Ward with thirteen piggeries and thirteen poudrette pits, just east of which, in the Twenty-sixth Ward, are five poudrette pits but no piggeries; the remaining group is along the Schuylkill River in the vicinity of Maiden Lane, this section being north of Oregon Avenue, and contains twenty-one piggeries and no poudrette pits. This makes a total of a hundred and twenty-two piggeries and twenty-three poudrette pits in South Philadelphia.

It is reported that there are forty thousand pigs in the city of Philadelphia, half of which are below Market Street between the rivers. Respecting this district in South Philadelphia, may be added a quotation from an address made April 20th, 1912, at the Long-table Luncheon of the City Club by Bernard J. Newman, Executive Secretary of the Philadelphia Housing Commission:

"This whole area is one of marshes and swamps and deep ditches. The water is foul and brackish. Occasionally the owner will stack the pig filth. One such pile standing out in the open was valued the other day at $150. There are other owners more slovenly who do not save this filth, but clean out the pens into the ditches and swamps. This noon I was told that five hundred loads of this filth had been emptied in one bad spot in the swamp. Recently, this spot was pointed out to me as the site for two new homes. When we turned over the surface soil we found pig manure beneath. The whole area is unfit for habitation. It is below the ultimate city level and imperfectly drained * * *."

Along the same line upon the same occasion, Director Joseph S. Neff, M. D., of the Department of Health and Charities, in an address, said:

"It is not only the matter of keeping the pigs themselves that is objectionable to so many people, but it is because of the manure which collects, and the breeding of flies which I think are well understood by the general public today to be the least feared and the most destructive of our insect pests as far as the carrying of disease is concerned. You have your soil pollution and well pollution in those portions of the city where the city water pipes have not been extended. It is a very broad question * * *."

A great deal has been published relative to the insanitary condition in this section of the city, but the few facts already set forth serve to show clearly enough that the complaints heard are real and conditions such as exist there cannot fail

of having an influence upon the general health of the community. Whether any direct connection can be traced between the piggeries and poudrette pits and the typhoid fever prevalent in the district, remains to be determined. Suffice it to say that the vitiating influence of such surroundings has been recognized by sanitarians and it is quite likely only a question of a comparatively short time until these menaces and nuisances shall have been removed from the district.

HOUSING CONDITIONS AND DRAINAGE.

In the detailed study of the various wards comment has been made from time to time relative to bad housing conditions and poor drainage facilities in various parts of this water district. Realizing that Philadelphia was not free from areas of deterioration where properties are depreciating in value and conditions arising detrimental to the public health, the Philadelphia Housing Commission was called into activity by a conference of forty philanthropic and religious associations. It is not a part of the municipal government and its aim is to improve the housing conditions in Philadelphia. The Commission was organized September, 1909, and has since then published a large amount of data relative to these matters.

According to a map showing bad housing areas it is noted that this large water district—Central and South Philadelphia—is as bad as any other section of the city, if not worse. It is a well-known fact in the region east of Broad Street and south of Market there are marked areas of deterioration. Here are found congested districts, inferior houses, which in many cases are sadly overcrowded, inadequate water supply and lack of sewers. Respecting the latter, it was reported in 1912, that for an area in the Thirty-ninth Ward, between McKean and Wolf, South Ninth and South Twelfth Streets, comprising six city blocks, there were 1,176 houses, 582 of which were not underdrained. In the Thirty-sixth Ward, 595 out of 1,068 houses were not sewer-connected and 212 were partly underdrained, leaving only 261 in this area wholly underdrained. In these two areas about 12,000 persons resided and in these vicinities considerable typhoid fever occurred. The principal reason for such conditions as these is the lack of sewers. From the second annual report of the Philadelphia Housing Commission for the year ending December 31st, 1912, the following quotation is taken:—

"* * * Approximately twenty-five miles of built-up streets between Vine and Oregon Avenue and the two rivers, that is, in eight per cent. of the area of the city where twenty-two per cent. of the city population reside, were without sewers. * * *"

Since then, some additional sewers have been installed in this district but the entire area is by no means adequately sewered.

Dangerous consequences are attendant upon the insanitary conditions arising in localities where adequate underdrainage facilities are not provided. The rain water runs in the street and in many cases there are drains from the houses through which water used in cooking, scrubbing, bathing, and washing dishes is also turned into the highways. Often water collects in cellars because of lack of drainage. Moreover, where sewers are not provided there is found the privy vault. No one knows how many of these vaults there are in the city. Under the most sanitary conditions privy vaults are not desirable and it is readily conceivable that in many instances these conditions do not exist in this southern district. In these congested sections there are many so-called courts, which are small streets with but one opening leading off from a main street and here often the houses are overcrowded, the light and ventilation poor, and the sanitary conditions leave much to be desired.

Surroundings such as these are an aid to the spread of contagious diseases. When people cook, eat, and sleep in cellar and attic rooms of tenements or rear houses, and breathe in the air polluted by defective drainage and yard privies or vitiated by their own over-crowding, their vitality is bound to be lowered. No one can question the bad physical and moral effect upon the whole family of bad air, bad drainage, and over-crowded rooms. An attempt was made by the State Health officials to show a neighborhood infection, successful in some instances and in others rather doubtful, possibly for lack of sufficient data. There is a strong probability, however, that if the facts were really known, a number of the cases now designated as unknowns could be charged up to a neighborhood infection.

In a following table the typhoid fever cases by wards for the Central and South Philadelphia water district for the last thirteen years are given.

By a study of this table it will be seen that typhoid fever increased during the first three years of the period, fell off for the next two years and again increased in 1906, the year following, after which there was a further reduction, not so marked, in 1907, a little more so in 1908 and a decided reduction in 1909, when only 670 cases occurred. The greatest number in any year of the period was in 1906, when 2,570 cases occurred. From 1909 to the end of the period there was a

reduction in the number of cases, except for the year 1913, when 675 cases occurred. This reduction can be attributed to the filtering of the water. The totals for the various years show considerably more variation in the South Philadelphia than in the Central portion of the district.

The increase for the first ten months of the year 1913, may be accounted for possibly by the fact that it was a typhoid season and possibly some imperfectly filtered water may have passed into the distributing system. There is a possibility that dual pipe connections may have been an influencing factor in the spread of the disease. Causes of infection have been determined in a considerable number of the cases. There were imports from out of the city and contacts and secondary cases in the same household: there were neighborhood infections, typhoid due to the use of river water in various ways and there were also a large number of cases whose origin has not been accounted for.

The analyses of water collected from the mains show that there was contaminated water, some of which has evidently been due to the stirring up of the muddy deposits in the pipes. The tests made by the State Health Department showed the presence of sewage organisms in this mud. Some of the B. Coli found may have entered the piping system through the dual pipe connections.

Following the table showing the typhoid fever cases by wards for the thirteen years, is a table setting forth in detail the causes of infection as determined by a study of the cases. This is a summary of the determined causes compiled from the records of each ward as before discussed.

TYPHOID FEVER CASES FOR THIRTEEN YEARS IN THE CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICTS.

CENTRAL DISTRICT.

Wards.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
5,	35	37	87	64	41	105	83	50	21	30	16	21	33
6,	21	22	37	31	7	39	36	29	16	8	6	10	9
7,	85	114	178	110	84	191	176	93	33	35	18	28	36
8,	23	56	73	35	66	81	66	56	27	20	15	18	10
9,	22	20	29	20	25	32	38	24	16	5	2	2	4
10,	60	75	110	44	89	100	95	55	30	22	11	23	15
Total, Central,	246	324	514	304	312	548	494	307	143	120	68	102	107

SOUTH PHILADELPHIA DISTRICT.

1,	185	192	358	177	82	224	176	153	73	53	26	51	80
2,	117	89	161	207	123	295	236	139	72	83	40	66	76
3,	98	102	216	176	76	205	172	90	31	35	20	29	45
4,	71	70	152	160	78	159	138	77	33	34	27	38	32
35,	99	138	355	270	124	302	295	194	80	73	43	55	117
36,	78	125	192	162	75	201	184	127	47	27	21	9	17
37,	135	223	352	320	134	370	330	309	109	62	21	63	84
39,	94	156	213	267	138	266	221	194	82	66	31	44	117
Total, South,	877	1,095	1,999	1,739	830	2,022	1,752	1,283	527	433	239	345	568
Grand total,	1,123	1,419	2,513	2,043	1,142	2,570	2,246	1,590	670	553	307	447	675

TABLE SHOWING DETERMINED CAUSES OF INFECTION—CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICT—1913.

Determined Causes.	Central.	South Phila.	Total.
Imported cases,	19	50	69
Secondary cases,	3	56	59
Contacts,	14	19	33
Contact with river water,	(9) (36)		(45)
River bathers,	1	16	17
Drinking river water,	4	6	10
Wharf laborers,	1	5	6
Traveled on steamers,	2	4	6
Worked on Greenwich piers,	0	3	3
Worked on river,	0	1	1
Otherwise,	1	1	2
Bathed in ponds,	0	1	1
Stetson factory employees,	0	8	8
Neighborhood infection,	0	8	8
Not typhoid,	0	2	2
Doubtful diagnosis,	2	1	3
Possible oyster infection,	1	0	1
Total determined causes,	48	181	229
Unknown.			
Could not be reinvestigated,	(0) (21)		(21)
Finally undetermined,	(59) (366)		(425)
Total,	59	387	446
Total cases,	107	568	675

SUMMARY SHOWING SEX AND AGE OF TYPHOID FEVER CASES—CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICT—1913.

Age Period.	M.	F.	Total.	Classification.	
0-4,	21	16	37	Infants,	37
5-9,	67	50	117	Children,	117
10-14,	71	57	128	Minors,	252
15-19,	82	42	124		
20-24,	70	34	104	Of age,	173
25-29,	45	24	69		
30-34,	30	9	39		
35-39,	21	7	28	Middle age,	87
40-44,	9	3	12		
45-49,	5	3	8		
50+,	7	2	9	Old age,	9
Total,	428	237	675		675

TABLE SHOWING IN DETAIL SEX AND AGE—TYPHOID FEVER CASES IN CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICT—1913.

Wards.	Age Periods. 0-4.			5-9.			10-14.			15-19.			20-24.			25-29.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Central District.																		
5.	0	2	2	3	1	4	2	4	6	1	1	2	9	2	11	3	2	5
6.	0	0	0	1	1	2	1	1	2	0	0	0	2	0	2	2	0	2
7.	0	2	2	2	2	4	5	2	7	5	0	5	2	4	6	2	3	5
8.	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1	1	1	2
9.	0	0	0	0	0	0	0	0	0	2	0	2	1	1	2	1	0	1
10.	0	0	0	0	1	1	0	0	0	0	0	0	3	2	5	3	0	3
Total.	2	2	4	7	5	12	9	7	16	8	2	10	19	9	28	12	6	18
South Philadelphia District.																		
1.	2	1	3	8	7	15	12	5	17	12	5	17	4	5	9	8	3	11
2.	0	3	3	6	7	13	9	8	17	11	10	21	8	0	8	1	0	1
3.	1	2	3	4	0	4	4	2	6	13	2	15	6	2	8	3	1	4
4.	1	0	1	4	1	5	0	3	3	5	3	8	5	2	7	4	1	5
24.	7	3	10	9	16	25	11	12	23	16	7	23	7	9	16	3	7	10
25.	1	0	1	2	0	2	1	1	2	2	0	2	1	0	1	3	0	3
30.	4	2	6	5	3	8	12	7	19	4	4	8	7	4	11	8	6	14
36.	3	3	6	22	11	33	13	12	25	11	9	20	13	3	16	3	0	3
39.																		
Total.	19	14	33	60	45	105	62	50	112	74	40	114	51	25	76	33	18	51
Grand total.	21	16	37	67	50	117	71	57	128	82	42	124	70	34	104	45	24	69

TABLE SHOWING IN DETAIL SEX AND AGE—TYPHOID FEVER CASES IN CENTRAL AND SOUTH PHILADELPHIA WATER DISTRICTS—1913—Continued.

Age Periods.

Wards.	30-34.			35-39.			40-44.			45-49.			50—.			Totals.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Central District.																		
5,	2	0	2	0	1	1	0	0	0	0	0	0	0	0	0	20	13	33
6,	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	7	2	9
7,	2	1	3	0	0	0	2	0	2	0	1	1	1	0	1	23	13	36
8,	0	1	1	1	0	1	0	0	0	0	0	0	2	0	2	8	2	10
9,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
10,	1	0	1	0	0	0	1	1	2	1	0	1	0	0	0	11	4	15
Total,	5	2	7	2	1	3	3	1	4	1	1	2	3	0	3	71	36	107
South Philadelphia District.																		
1,	3	0	3	2	0	2	1	0	1	2	0	2	0	0	0	54	26	80
2,	5	2	7	3	0	3	1	1	2	0	0	0	1	0	1	45	31	76
3,	3	0	3	0	1	1	0	0	0	0	0	0	1	0	1	35	10	45
4,	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	22	10	32
26,	2	0	2	2	1	3	1	0	1	2	1	3	1	0	1	61	56	117
30,	1	2	3	0	0	0	1	0	1	0	0	0	1	1	2	13	4	17
36,	7	1	8	4	4	8	1	0	1	0	0	0	0	1	1	52	32	84
39,	3	2	5	6	0	6	1	1	2	0	1	1	0	0	0	75	42	117
Total,	25	7	32	19	6	25	6	2	8	4	2	6	4	2	6	357	211	568
Grand total,	30	9	39	21	7	28	9	3	12	5	3	8	7	2	9	438	237	675

SCHUYLKILL RIVER WATER DISTRICT.

The General Schuylkill River Water District, as it is termed, is subdivided into four parts, named according to the filter plant from which the public water supply is obtained. These are known as the Belmont, Queen Lane, Lower Roxborough, and Upper Roxborough District respectively. Each district will be taken up separately and finally a summary for the entire district will be given. It is pertinent, however, to outline the entire district first because all of the water supplied in the district is obtained from the Schuylkill River, with possibly the exception of a small amount of water from the Torresdale filter plant that may reach a little section of the district by way of the Corinthian reservoir. Roughly speaking, this general water district may be defined as all of the city territory lying west of a line extending from the northern city line south on Broad Street to Sedgley Avenue and Cambria Street, thence along Sedgley Avenue in a southwesterly direction to North Twenty-seventh Street and south on North Twenty-seventh Street to the Schuylkill River, which stream from here to its mouth forms the dividing line between the Torresdale and the Schuylkill River Water Districts. The territory thus outlined includes practically all of West Philadelphia, Falls of Schuylkill, Wissahickon, Manayunk, Roxborough, Germantown, Chestnut Hill, and a portion of the city territory lying east of the Schuylkill River in the vicinity of Fairmount Park. Five of the six wards in the Belmont District are wholly included.

The exception here is the Thirty-fourth Ward in which a very small part of the ward, known as Overbrook, is supplied with water by the Overbrook Steam Heat Company, obtaining the supply from the Springfield Water Company, filtered Crum Creek or Pickering Creek water. For all practical purposes, in this present study, this entire ward may be considered as being in the Belmont District as the Overbrook section in Philadelphia contains a very small proportion of the Thirty-fourth Ward population, probably 2,500 out of 50,000. Furthermore, in 1913 only two of the Thirty-fourth Ward cases resided in Overbrook and each case was found to be imported.

In all the rest of the territory the water district lines divide up the wards to such an extent that each ward has two or more district water supplies. In some instances the ward is supplied entirely with the Schuylkill River water and in others, part of the ward is supplied with Schuylkill River water, with Delaware River water and in one instance, namely, the Forty-second Ward, in addition to these two supplies, a small portion of the ward receives its supply from the Springfield Water Company. From the foregoing it is evident that the water supply existing in this section of the city is more or less complicated. In the sub-joined table these facts are shown in a summarized form; this also shows the populations actual or estimated in each ward served with water from the Schuylkill River, as well as the number of typhoid fever cases occurring in the period studied, namely, from January to October inclusive, 1913. The population figures are based on the 1910 Federal Census.

POPULATION AND TYPHOID FEVER CASES—JANUARY TO OCTOBER, 1913 INCLUSIVE—IN WARDS WHOLLY OR IN PART SERVED WITH SCHUYLKILL RIVER FILTERED WATER.

WARD.	POPULATION.		TYPHOID FEVER CASES.	
BELMONT DISTRICT.				
24th, entire,	54,000		32	
27th, entire,	24,000		10	
34th, entire,*	50,000		36	
40th, entire,	42,000		50	
44th, entire,	39,000		17	
46th, entire,	38,000	247,000	31	176
QUEEN LANE DISTRICT.				
15th, part,	1,000		0	
29th, part,	15,000		9	
32nd, part,	10,000		12	
28th, part,	24,000		14	
38th, part,	35,000		19	
37th, part,	7,000		0	
43rd, part,	12,000	104,000	1	54
LOWER ROXBOROUGH DISTRICT.				
21st, part,,	12,000		9	
38th, part,	14,000		6	
22nd, part,	18,000		16	
42nd, part,	400		4	
43rd, part,	7,000	51,400	3	38

UPPER ROXBOROUGH DISTRICT.

21st, part,	24,000		9	
22nd, part,	53,000		12	
42nd, part,	1,900	78,900	1	22
Total,		481,300		290

*Overbrook gets water from Springfied Water Company.

The entire city of Philadelphia in 1910 had a population of slightly over 1,500,000 so that from the above table it appears that about thirty per cent. of the entire population of the city resided in the district served with water from the Schuylkill River. From January to October inclusive, 1,529 cases of typhoid fever occurred in the entire city of which number 290 belong in the Schuylkill River water district, which is close to nineteen per cent. of the entire number of cases occurring in the city. Reduced to a basis of cases in a hundred thousand, the Schuylkill River district had sixty and the balance of the city had one hundred and twenty-two, twice as many. It will be shown later that a considerable number of the cases occurring in the Schuylkill River District are presumed to have contracted the disease in the down town section of the city or at least outside of the district in which they resided.

At present sixty-five per cent. of the total public water supply is taken from the Delaware River and filtered at the Torresdale filter plant. The remaining thirty-five per cent. is from the Schuylkill River and is filtered in the four filtration plants located along this stream. The nominal daily capacity of each station is as follows, although these amounts are not actually produced:

SCHUYLKILL RIVER:

Lower Roxborough,	12,000,000 gallons
Upper Roxborough,	20,000,000 gallons
Belmont,	40,000,000 gallons
Queen Lane,	70,000,000 gallons

DELAWARE RIVER:

Torresdale,	240,000,000 gallons
Total,	382,000 000 gallons

BELMONT WATER DISTRICT.

The Belmont Water District comprises what is known as West Philadelphia and is that section of the city lying entirely west of the Schuylkill River. It contains practically all of six entire wards and a population of approximately 247,000 persons. A portion of Fairmount Park is located in the northern part of this district. Three of the wards, namely, the Twenty-fourth, the Forty-fourth, and Thirty-fourth are located to the north of Market Street, which extends in an east and west direction through the district. The other three wards, the Twenty-seventh, Forty-sixth, and Fortieth are south of Market Street. Except along the river, where some manufactories are found, the district is characteristically residential, with the denser population flanking Market Street. The southern half of the western edge of the district is defined by Darby and Cobbs Creeks, which also mark the city line. The western edge of the district merges into the territory of Montgomery and Delaware Counties immediately adjacent. The southern part of the district in the Fortieth Ward is sparsely settled, many truck farms being found in this vicinity. In the Belmont District is found the extensive plant of the University of Pennsylvania.

The filtration plant, from which this district, with the exception of Overbrook, is served with a public water supply, was the third of the city filter plants to be constructed, being built and put in operation in 1904. It is in the northern part of the district, at Ford Road and Belmont Avenue, and filters the water for the entire section of the city west of the Schuylkill River. This station receives its supply from the Belmont pumping station located in West Fairmount Park, on the Schuylkill River near the Columbia Avenue Bridge. The following description of this plant is quoted from a bulletin issued by the City Department of Public Works in 1909.

"The Belmont station consists of two subsiding basins having a capacity of 36,000,000 gallons each, or representing approximately about one day's sedimentation of the water; nine preliminary tanks and eighteen plain sand filters; a clear water basin; eight hopper sand washers, electric lighting equipment, laboratories, etc.

"The sedimentation reservoir consists of two divisions or basins each twenty-five feet deep measured at the flow line, elevation 279 C. D. The reservoir is constructed on the hillside, and is partly in excavation and partly in fill. The embankments

are eighteen feet wide at the top with a two to one slope on both sides. The lining consists of a layer of clay puddle eighteen inches in thickness consisting of a prepared clay and gravel. On top of the puddle on the floor a five inch layer of concrete was placed, and on the slopes the concrete has an average thickness of seven inches. Over the concrete floor and extending half way up the slopes was placed an asphalt lining three-quarters inch thick, which was placed in two layers, each uniformly three-eighth inch thick, consisting of a mixture of asphalt, asphaltic mastic and grit.

"The valves for controlling the admission and discharge of the water are located in the gate chamber, constructed at the end of the division embankment on the outer side. These valves are arranged that either basin can be used independently of the other or both may be by-passed. In order to obtain a high degree of sedimentation for this reservoir, the piping is so arranged that the water is forced through a main laid on the floor in each basin with outlets near their extreme ends. The water then passes diagonally across one of the basins to a floating discharge pipe near the end of the division embankment, and is likewise delivered at the extreme end of the opposite basin, and before the water is delivered to the filters it must pass the entire length of the basin, where it is drawn from the top through another floating pipe connected to the screen chamber thus completing the full transit to both compartments of the reservoir.

"As at Lower Roxborough, the water, after leaving the sedimentation basin, is passed through preliminary filters which were constructed under a guarantee contract with Mr. P. A. Maignen after his own plans. There are nine separate filter tanks divided into three compartments each. The first compartment, is uncovered, contains ordinary coke, and the water is admitted at the bottom at the end of the tank and passes horizontally to the next compartment, which is filled with a sponge layer of about six feet deep. The water is introduced at the bottom of this compartment and passes upward through the sponge and flows on to the third compartment, which contains a layer of coke breeze ranging from one-eighth to one fourth inch in diameter. The water is filtered downward through the coke breeze at the rate of forty million gallons per acre per day.

"Experience with this system showed that the first and second compartments are not economical in operation for reducing turbidity and the coke breeze is now depended upon to do the work. The original arrangement to clean the coke breeze was cumbersome and several different methods were tried, but as none gave satisfaction, the city finally installed a Blaisdell washing machine. This machine consists of an inverted box about four feet square and two feet deep, which is sunk under the water in the filter to the filtering surface and is held in position and operated from a movable platform supported on the filter walls. The box contained a revolving hollow axle and head from which perforated teeth project into the filter any desired distance. The box can be raised or lowered and the platform moved longitudinally or laterally, all electrically operated by one man. The box is moved over the surface of the filter while at the same time the teeth are made to revolve slowly. Water under a pressure of twenty pounds per square inch is introduced through the axle, head and teeth, passing in fine streams into the coke through the holes in the teeth.

"A centrifugal pump connected with the top of the box draws away a little more water than is supplied through the teeth and discharges it to the sewer. The machine is constructed so that it can be transferred easily from one filter tank to another.

"The general arrangement of the final filters is irregular owing to the shape of the property on which they are located and are grouped in three batteries of six each. The topography of the site was such that the filters were constructed in a series of steps conforming as closely as possible to the original surface, the greatest vertical distance between any two filters being three feet. The filters are rectangular in shape, eight measuring 120 feet 2 inches by 272 feet 8 inches on the neat lines, seven measuring 135 feet 5 inches by 242 feet 2 inches, and the other three 165 feet 11 inches by 196 feet 5 inches.

"Each filter is approximately 0.735 acre in filtering area and with prefiltered water is capable of being operated at a maximum rate of six million gallons per acre daily, giving a capacity of 67,000,000 gallons daily for the final filters. A year's trial on two of the filters has amply demonstrated the practicability of the six million rate at this station. However, the capacity of the preliminary filters is about 40,000,000 gallons daily and is the limiting feature of this station's output. By remodeling the coarse coke and sponge compartments, it will be possible to bring the capacity of the prefilters up to that of the final filters with comparatively small cost.

"The general construction of the filters is similar to those of Lower and Upper Roxborough, the floor, piers, walls, vaulting and puddle lining being essentially the same.

"In such portions of the floors as were built on fill, expanded metal was embedded in the concrete. As far as possible the regulating chambers of two adjacent filters were constructed in one house at the end of the dividing walls between the filters, but where the location and elevation were such that this could not be accomplished, single chambers were provided. Each filter has its own valve chamber in which is located the floating weir for controlling the rate of filtration.

"The filtered water basin is rectangular in plan, measuring 382 feet 2 inches by 396 feet on the neat lines and has an available depth of fifteen feet for storing water, with a capacity of 16,500,000 gallons. In general construction it is similar to the filters and to those constructed at Roxborough. The filtered water is admitted through an inlet chamber at one corner, and is drawn off in another from the bottom direct to the distribution mains.

"The Belmont pumping station is located on the Schuylkill River in West Fairmount Park near the Columbia Avenue railroad bridge, and is about five miles below the Roxborough pumping station. It consists of two Bethlehem Steel Company's horizontal compound pumps of ten million gallons daily capacity, one Worthington compound pump of seventeen million gallons capacity, and three Holly compound pumps of ten million gallons daily capacity.

"The boiler equipment consists of twenty-six 125 H. P. internally fired tubular boilers."

In March 1912 apparatus was installed at this plant to introduce a chemical disinfectant into the water. This comprises concrete mixing and feeding tanks as is usual in such installations. The flow from the feed tank is through a hand regulated stop cock. An operator at the plant visits the tank each hour and regulates and records the rate of flow. The effluent from the entire plant is treated as it enters the filtered water storage basin.

As a matter of historical interest the following table is given showing the typhoid fever cases occurring in this district from 1901 to 1913 inclusive, the cases for 1913 from January to October inclusive.

TYPHOID FEVER CASES IN BELMONT WATER DISTRICT, 1901-1913 INCLUSIVE.

Wards.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
34,	224	364	430	422	123	186	95	87	65	50	30	30	32
37,	124	238	277	249	113	148	83	44	50	21	19	13	19
38,	317	347	456	471	219	236	67	44	47	47	35	34	36
40,	103	114	199	243	83	100	50	65	36	28	44	31	30
44,	.....	.....	.....	.....	.....	.....	53	33	27	24	25	14	17
46,	.....	.....	.....	....	.....	.....	.....	31	29	29	34	32	31
Total,	868	1,163	1,362	1,355	538	730	348	309	224	199	178	154	176

From a plan furnished by the city authorities it appears that filtered water was first introduced into West Philadelphia on June 3, 1904, at which time a small area in the Twenty-fourth and Twenty-seventh wards respectively, on both the north and south sides of Market Street received the filtered water supply. On January 1st, 1905, the filtered water district was extended so as to include the remaining territory north and south of Market Street in these two wards as far north as Fairmount Park. On September 1st, 1906, the service was further extended so as to supply all of the Belmont District with filtered water. With these facts in mind the table just given can be intelligently studied. It is therein shown that up to and including the year 1904, the number of typhoid fever cases was very large. The year 1905 marked a decrease in this number which has since persisted except for 1906. For the first ten months of 1913, however, more cases occurred in the district than in the entire preceding year. A later table however, will indicate that about one-fourth of the total number of the cases of 1913 came in contact with other water supplies, chiefly that furnished from the Torresdale plant. In fact out of the one hundred and seventy-six cases in the entire water district only forty-seven are of unknown origin.

Prior to 1908, the present division of wards in the Belmont District did not obtain, but beginning with 1908 a comparative study of the wards as now outlined can be made. In the table given below the typhoid fever cases in the Belmont Water District by months for the six year period from 1908 to 1913 inclusive are shown, followed by a table showing the occurrence of these cases during the open season, April to October inclusive, for the six year period, which indicates that the majority of these cases for each year, occurred during the season when the people are moving around to a greater or less extent, in many instances leaving the city:

TYPHOID FEVER CASES IN THE BELMONT WATER DISTRICT FOR SIX YEARS.—POPULATION 247,000.

Month.	1908.	1909.	1910.	1911.	1912.	1913.
January,	25	15	12	13	15	3
February,	28	11	11	13	11	10
March,	27	15	11	13	16	9
April,	24	12	4	9	10	5
May,	20	15	15	7	14	9
June,	15	7	6	6	17	18
July,	12	28	16	9	7	27
August,	47	20	21	26	23	35
September,	48	31	49	28	14	33
October,	27	31	25	28	15	27
November,	17	10	13	11	8	..
December,	19	29	16	15	4	..
Total,	309	224	199	178	154	176

Typhoid Fever Cases in the Belmont Water District in the Open Season—April to October Inclusive—for Six Years.

Year.	1908.	1909.	1910.	1911.	1912.	1913.
Cases,	193	144	136	113	110	154

This brings the study of typhoid fever in the district down to the present period. By investigation it was discovered that in 1913, from January to October inclusive, a hundred and seventy-six cases of typhoid fever occurred in the Belmont water district. The onset of these cases for each ward in the district by months is shown in the following table, which also gives the case rate for the hundred thousand population:

SUMMARY OF TYPHOID FEVER CASES IN THE BELMONT WATER DISTRICT. ONSETS BY MONTHS—JANUARY TO OCTOBER (INCLUSIVE)—1913.

Month.	Wards.						Total.
	24.	27.	34.	40.	44.	46.	
January,	0	1	0	1	0	1	3
February,	1	0	1	3	3	2	10
March,	3	1	1	1	1	2	9
April,	2	0	3	0	0	0	5
May,	1	0	2	2	1	3	9
June,	1	1	3	6	3	4	18
July,	6	0	5	11	1	4	27
August,	2	3	6	14	4	6	35
September,	10	3	5	7	1	7	33
October,	6	1	10	5	3	2	27
Total,	32	10	36	50	17	31	176
Cases per 100,000 population,	59	42	72*	119	43	81	71

*Includes two cases in Overbrook (Springfield Water Co. Supply.)

A further detailed study of the 1913 cases was made as relates to sex and age periods. Slightly over one-half of all the cases fall into the age period from ten to twenty-nine inclusive. In actual figures there were ninety-nine of such cases. These facts are shown in the next table:

SUMMARY OF TYPHOID FEVER CASES, BELMONT WATER DISTRICT—AGE PERIODS.

Ages.	Wards. 24 M.	24 F.	24 T.	27 M.	27 F.	27 T.	34* M.	34* F.	34* T.	40 M.	40 F.	40 T.	44 M.	44 F.	44 T.	46 M.	46 F.	46 T.	Total. M.	Total. F.	Total. T.	Classification.
0- 4, ...	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	1	1	2	2	2	4	Infants, ... 4
5- 9, ...	1	0	1	0	1	1	4	2	6	2	6	8	1	1	2	1	3	4	9	13	22	Children, ... 22
10-14, ...	1	2	3	1	0	1	1	2	3	3	4	7	0	1	1	2	2	4	8	11	19	Minors, ... 54
15-19, ...	3	3	6	0	0	0	9	3	12	5	4	9	3	0	3	3	2	5	23	12	35	
20-24, ...	4	2	6	1	2	3	3	2	5	4	2	6	0	3	3	0	2	2	12	13	25	Of age, ... 49
25-29, ...	3	2	5	2	0	2	2	0	2	5	0	5	1	1	2	6	2	8	19	5	24	
30-34, ...	2	2	4	1	0	1	1	2	3	3	1	4	2	0	2	1	0	1	10	5	15	
35-39, ...	1	2	3	0	0	0	1	1	2	2	2	4	0	1	1	2	0	2	6	6	12	Mid. age, .. 40
40-44, ...	2	1	3	0	0	0	3	0	3	0	0	0	0	0	0	2	1	3	7	2	9	
45-49, ...	0	0	0	1	1	2	0	0	0	1	0	1	0	1	1	0	0	0	2	2	4	
50-+	0	1	1	0	0	0	0	0	0	2	2	4	0	2	2	0	0	0	2	5	7	Old age, ... 7
Total, ...	17	15	32	6	4	10	24	12	36	28	22	50	7	10	17	18	13	31	100	76	176	

*Includes two cases in Overbrook (Springfield Water Company).

A careful study of these cases was made with a view of determining a possible source of infection. The results obtained are shown in the table below, where it appears that for seventy-three per cent of the cases possible causes of infection can be assigned. Furthermore, a total of eighty-seven cases, or nearly seventy per cent. of the entire number of cases with a determined cause, were infected outside the district, or came in contact with other water supplies, chiefly that furnished from the Torresdale filtration plant. Most of these casese were investigated anew at the instance of the State Department of Health because of lack of definite data from the first investigation, so that the results as shown have been attained through a very careful study of all the facts that could be secured:

DETERMINED CAUSES OF INFECTION OF TYPHOID FEVER CASES IN THE BELMONT WATER DISTRICT. JANUARY TO OCTOBER INCLUSIVE—1913.

Determined Causes.	Wards.						
	24	27	31*	40	44	46	Total.
Imported,*	7	4	6	9	4	13	43
Secondary,	.....	1	.....	1	.....	.....	2
Contacts,	2	.....	2	2	2	.....	8
Not typhoid,	2	.....	2	1	.....	.....	5
Contact with river water:							
River bathers,	.....	.....	1	1	.....	.....	2
Traveled on boats,	1	.....	1	2	.....	1	5
Worked on Greenwich Pier,	1	.....	.....	.....	.....	.....	1
Drank river water,	.....	.....	.....	.....	1	2	3
Infected water districts,	9	4	12	11	4	4	44
Contact with sewage,	.....	.....	1	1	.....	.....	2
Cobbs Creek bather,	.....	.....	.....	2	.....	.....	2
Wedding breakfast (water cress infection),	3	.....	.....	5	.....	.....	8
Polluted spring water,	.....	.....	1	.....	.....	.....	1
Polluted well water,	.....	.....	.....	3	.....	.....	3
Total—Determined causes,	25	9	26	38	11	20	129
Unknown,	7	1	10	12	6	11	47
Total,	32	10	36	50	17	31	176

*In the 31th Ward two cases are included under "Imported" who resided in Overbrook and probably used Springfield Water Company supply. They were infected outside the city.

QUEEN LANE WATER DISTRICT.

The Queen Lane Water District lies on the east bank of the Schuylkill River in the vicinity of Fairmount Park opposite the northern section of the Belmont water district. Parts of seven wards are supplied with Schuylkill River water through the filter plant of the district. These same wards also receive other supplies. In the case of one, namely, the Forty-third ward, a supply is received from the Torresdale plant by way of the Wentz Farm and the Oak Lane Districts and also from both the Queen Lane and the Lower Roxborough filter plants. The Thirty-eighth Ward is furnished with Schuylkill River water only through the Queen Lane and the Lower Roxborough filter plants. Each of the other wards gets both Delaware River and Schuylkill River water. Directly north of the Queen Lane District is that supplied by the Lower Roxborough plant. On the east and south the territory supplied with Torresdale water adjoins.

The territory is irregular in shape having an estimated population of 104,000. On the west, it is bounded by the Schuylkill River and is otherwise outlined by a line extending from the river in a northeasterly direction along Nicetown Lane and Hunting Park Avenue to North Broad Street, thence following in a general southeasterly direction the Richmond Branch of the Philadelphia and Reading Railway to the intersection of Westmoreland Street and Sedgley Avenue then along Sedgley Avenue southwesterly to North 27th Street and south on North 27th Street to the Schuylkill River at Spring Garden Street.

The division of wards partly served from the Queen Lane plant and the typhoid fever cases occurring in 1913 from January to October inclusive, the wards and cases being separated according to the various water districts entering them, are clearly shown in the following table:

POPULATION AND TYPHOID FEVER—JANUARY TO OCTOBER (INCLUSIVE), 1913, IN WARDS SERVED WITH QUEEN LANE AND OTHER SUPPLIES.

Ward.	Total population.	Estimated Population in Water Districts.					Typhoid Fever Cases—Jan. to October inclusive—1913.					
		Torresdale.			Queen Lane.	Lower Roxborough.	Torresdale.			Queen Lane.	Lower Roxborough.	Total Cases.
		Wentz Farm.	Main.	Oak Lane.			Wentz Farm.	Main.	Oak Lane.			
43, ...	43,260	15,000	.....	9,000	12,000	7,000	12	.....	6	1	3	22
37, ...	23,110	.....	.....	16,000	7,000	.....	.....	.....	8	0	.....	8
38, ...	43,939	.....	.....	.....	35,000	14,000	.....	.....	.....	19	6	25
28, ...	49,242	.....	.....	25,000	24,000	.....	.....	.....	11	13	.....	24
32, ...	40,293	.....	.....	30,000	10,000	.....	.....	.....	18	12	.....	30
29, ...	30,217	.....	.....	15,000	15,000	.....	.....	.....	8	9	.....	17
15, ...	47,273	.....	3,000	43,000	1,000	.....	.....	9	21	0	.....	30
Total, ...	282,334	15,000	3,000	138,000	104,000	21,000	12	9	72	54	9	156

Along the river front of the Queen Lane District there are few if any industries, this ground taken up generally by East Fairmount Park and in the northern part by cemeteries. A number of important industries are scattered through the district, but it can be considered as mostly residential. The Queen Lane pumping station and reservoir together with the connecting pipe lines were placed in service during 1895. The filter plant was added to the city water works system during November 1911, being under construction in 1909. The following description of the pumping station and the filter plant is taken from the report of the City Water Bureau for 1909.

"The Queen Lane Pumping Station is located on the Schuylkill River in east Fairmount Park approximately 600 feet below the mouth of the Wissahickon Creek. It consists of four Southwark vertical triple expansion pumps of twenty million gallons daily capacity each, twenty-four internally fired tubular boilers of 200 H. P. each.

"The pumps are connected with the river intake by two masonry conduits leading into either end of the engine rooms each supplying two pumps. Gates and screens are provided at the intake which is constructed in two sections of rubble masonry. As at Lardner's Point, the pumps ends of each pumping engine are located in the basement with the floor intervening at an elevation so that the engines and crank shafts are above the floor level. The smoke flues in the boiler house are connected to a stack two hundred feet high, twelve feet internal diameter.

"A modern coal handling plant is about to be installed to take the coal from the Reading Railroad, nearby, and transport it to the boiler room by tunneling under Ridge Avenue and Park property.

"Water is delivered from this station to the Queen Lane reservoir through two lines of forty-eight inch cast iron pipe.

"This filter plant as planned and under construction contemplates using the south basin of the Queen Lane reservoir as a sedimentation basin which has a capacity of 177,000,000 gallons or about two and one-half day's sedimentation with the filters working at their nominal rate of 70,000,000 gallons per day. It is thirty feet deep with an elevation of 238 C. D. at its flow line. Water will be introduced at one corner and drawn off at the other end through a gate chamber to be constructed as a part of the filter plant.

"The water after passing from the sedimentation basin is delivered to preliminary filters through a seven foot steel conduit surrounded by concrete, and is controlled in a circular gate chamber located at the eastern end of the embankment next to the filters by three, three feet by four feet hydraulically operated sluice gates.

Preliminary Filters.

"The preliminary filters, forty in number, measuring thirty-two by forty feet each, are located partly on the original reservoir embankment and partly on fill, in two rows, separated by a power house and administration building at the centre, making two separate preliminary filter operating galleries. In all their essential details these filters are, with the exception of their interior dimensions, identical with those constructed and in operation at Torresdale, excepting that the water is introduced at the front instead of at the rear, and is drawn off through an effluent discharge located immediately under the raw water supply, both of which are located under the floor of the operating gallery. The effluent is discharged at an elevation of 245 C. D. from both batteries in the centre line of the plant, where it is carried through a main supply in the centre of the final or sand filters. These filters are all covered by a reinforced concrete roof. The elevation of the water surface is fixed at 231.25 C. D. or 6.75 feet below the flow line of the sedimentation basin.

Final or Slow Sand Filters.

"The filters will be located immediately west of the preliminary filters inside of the north basin of the reservoir. The method of filtration is the same as employed at the other stations, but the filters are constructed on different lines, inasmuch as they will be built immediately over the filtered water basin and supported on piers and groined arches. There are twenty-two separate beds each having dimensions of 344 feet 5 inches by 96 feet. They are arranged in two groups or batteries separated by a court twenty feet wide under which are placed the raw water conduit and the necessary piping and drains. The supply will be received from the preliminary filters through a rectangular, reinforced steel conduit 10 feet wide by 7 feet 4 inches high, which is connected to each filter by a twenty inch pipe leading through the chamber of the regulating house in which is placed a valve to regulate the rate of flow into the filter.

"The filtered water is passed from each filter direct through a rectangular orifice placed in the wall of the chamber of the regulating house to the filtered water basin. The only piping required to be extended the full length of the plant is the refill pipe, which is twelve inches in diameter and two lines of pressure pipe for washing sand, which are twelve inches in diameter.

"The filters are supported on rectangular piers constructed on sixteen feet centres, two feet six inches square, extending through the floor of the reservoir, the foun-

dations for which are carried to rock. The floor of the filters forms the roof of the filtered water basin and is constructed of groined arches ten inches thick at the crown with a rise of three feet nine inches. The side walls have a minimum thickness of two feet and are of reinforced concrete. The main collector is built of reinforced concrete in two sections, each having an area of nine inches by four feet, covered by a reinforced concrete slab six inches thick. The lateral collectors are of six inch terra cotta pipe extending either side from the main collector spaced at sixteen feet intervals.

"The filter roof is carried on square concrete piers spaced on five foot centres and average about six feet in height, allowing head room between the water surface in the filters, and the underside of the roof beams of a minimum of five feet. The roof is of reinforced concrete supported on reinforced beams nineteen inches deep and six inches wide and thirty-two feet span. The roof proper is six inches thick.

"The filtering material will consist of a layer of gravel sixteen inches in depth, varying in size from three inches in diameter to about one-sixteenth inch in diameter. Over the gravel is placed a layer of sand twenty inches in depth. Requirements as to size, etc., are the same as at the other stations.

"The regulating houses all face the centre court or aisle and each accommodates two filters. The filters will be drained at the rear through a twenty inch pipe, which connects with a drainage system leading to the sewers.

"The power station and administration building are located at the eastern end over the discharge pipes, in the centre of the plant. In the power house will be placed boilers and pumps for pumping water for cleaning the filters, and the electric lighting equipment, etc. A steel tank thirty-five feet in diameter and thirty feet high is supported above the roof and will be used to store wash water for the preliminary filters. It is enclosed by brick walls architecturally treated to conform to the other buildings.

"The administration building adjoins the power house and will be arranged with lockers and quarters for the men, as well as offices for the Superintendent, etc.

"Filtered Water Basin.

"As already indicated, the plant is a two-story structure the filtered water basin occupying the entire space under all the final filters, a space 1,056 feet by 709 feet, and when filled to its nominal depth, nine feet, it will have a capacity of 50,000,000 gallons, or approximately two-thirds of a day's supply for the district.

"Excepting one, the east, the side walls are of plain concrete four feet six inches thick and support the side walls of the final filters. The east wall is formed by the retaining wall supporting the embankment under the preliminary filters. The floor of the original reservoir forms the floor of the filtered water basin, and is lined with four inches of concrete covered with two inches of asphalt concrete.

"Two riveted steel outlets covered with six inches of concrete, five feet in diameter, connect with the original gate chamber of the reservoir, a part of which is left intact under the power house. By this arrangement the old gates and outlet pipes are made use of."

Filtered water was introduced into this district from Allegheny Avenue north, this comprising approximately one-third of the entire territory, on July 3rd, 1903. The remainder of the territory was supplied with filtered water December 1st, 1911 since which time the entire territory has received filtered water. On November 20th, 1911, apparatus was installed in connection with the Queen Lane filter plant to introduce a chemical germicide into this supply.

Typhoid Fever in the Queen Lane District.

From the table previously given it appears that in the seven wards partly supplied with water from the Queen Lane plant there was a total of a hundred and fifty-six cases of typhoid fever from January to October inclusive in the year 1913. Because of the numerous supplies entering into these wards, these being introduced from time to time, it has been practically out of the question to make a study of the typhoid for the district prior to 1913. There was a noticeable lack of data respecting the cases occurring in the period just studied and when a special effort had been made to thoroughly investigate each case it was discovered that this was even more marked relating to these cases occurring in earlier years. So the study of typhoid for this district has been confined to the cases occurring during the first ten months of 1913, with special attention in this particular report to the cases located in these seven wards in the Queen Lane District. Detail facts relative to the cases in other parts of these same wards have been discussed elsewhere under their proper water district.

The occurrence of the cases in the Queen Lane District by months for each ward is indicated in the sub-joined table:

SUMMARY OF CASES FOR THE ENTIRE QUEEN LANE WATER DISTRICT, 1913.

By months and by wards.

Month.	Wards (Parts of).							
	15	29	32	28	38	37	43	Total.
January,	0	0	1	0	4	0	0	5
February,	0	0	1	0	0	0	1	2
March,	0	1	0	1	0	0	0	2
April,	0	0	3	2	3	0	0	8
May,	0	2	1	1	4	0	0	8
June,	0	0	1	0	1	0	0	2
July,	0	1	4	2	2	0	0	9
August,	0	3	0	7	1	0	0	11
September,	0	2	0	0	4	0	0	6
October,	0	0	1	0	0	0	0	1
Total,	0	9	12	13	19	0	1	54
Case rate per 100,000 population,	0	60	120	54	54	0	8	51

From the foregoing it may be noted that the case rate in the Thirty-second Ward is double that of any of the other wards. All but nine of the cases in the water district occurred during the open season from April to October inclusive, with the greatest number in any month occurring in August.

The next table following shows the fifty-four cases occurring in this district separated as to sex and ages by wards:

SEX AND AGES OF TYPHOID FEVER CASES OCCURRING IN THE QUEEN LANE WATER DISTRICT, JANUARY TO OCTOBER INCLUSIVE—1913.

	Wards.																Total.			Classification.	Cases.
	15	29			32			28			38			37	43						
		M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.		M	F.	T.	M.	F.	T.	
0- 4,	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	1	1	2	Infants, 2
5- 9,	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	1	1	2	Children, 2
10-14,	0	2	0	2	0	1	1	1	2	3	1	2	3	0	0	0	0	4	5	9	Minors, 14
15-19,	0	0	0	0	2	0	2	1	0	1	0	2	2	0	0	0	0	3	2	5	
20-24,	0	3	3	6	1	1	2	2	0	2	1	0	1	0	1	0	1	8	4	12	Of age, 22
25-29,	0	1	0	1	1	1	2	2	1	3	1	3	4	0	0	0	0	5	5	10	
30-34,	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	
35-39,	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	2	0	2	Mid. age, 11
40-44,	0	0	0	0	1	0	1	0	1	1	1	2	3	0	0	0	0	2	3	5	
45-49,	0	0	0	0	2	0	2	1	0	1	0	0	0	0	0	0	0	3	0	3	
50-+,	0	0	0	0	1	1	2	0	0	0	0	1	1	0	0	0	0	1	2	3	Old age, 3
Total,	0	6	3	9	8	4	12	9	4	13	7	12	19	0	1	0	1	31	23	54	

It appears here, as in the Belmont District, that a fair percentage of the total cases falls into the group between ten and thirty, an age when there is considerable likelihood of change in environment. In this connection it is interesting to note that almost one-half of the cases have been charged to sources of infection found outside of this particular water district.

Of the fifty-four cases in the district, possible sources of infection have been assigned to thirty-two, leaving twenty-two unknown. A few of these cases were reinvestigated, but taken as a whole there was a lack of very definite information concerning them. From the data at hand causes have been assigned as appear in the table following herewith:

DETERMINED CAUSES OF INFECTION OF TYPHOID FEVER CASES OCCURRING IN THE QUEEN LANE WATER DISTRICT—JANUARY TO OCTOBER INCLUSIVE, 1913.

Determined Causes.	Wards.							Total.
	43	37*	38	28	32	24	15*	
Imported,	1	.....	3	2	3	2	.....	11
City water of the infected district,	.....	.....	3	3	2	2	.....	10
Contact with sewage,	.....	.....	1	.....	.....	.....	.....	1
Not typhoid,	.....	.....	2	.....	.....	.....	.....	2
Contact,	.....	.....	.....	1	1	.....	.....	2
Driver,	.....	.....	.....	1	.....	.....	.....	1
River bather,	.....	.....	.....	1	.....	1	.....	2
Shell fish,	.....	.....	.....	1	.....	.....	.....	1
History incomplete,	.....	.....	.....	.....	1	.....	.....	1
Secondary,	.....	.....	.....	.....	.....	1	.....	1
Total determined causes of infection,	1	.....	9	9	7	6	.....	32
Unknown,	0	.....	10	4	5	3	.....	22
Total,	1	.....	19	13	12	9	.....	54

*No cases.

As a matter of interest in this connection there is shown following a table giving the determined cases of infection of all the cases occurring in the wards which are in part supplied with water from the Queen Lane plant:

DETERMINED CAUSES OF INFECTION OF TYPHOID CASES IN WARDS SERVED WITH QUEEN LANE AND OTHER WATER SUPPLIES.

Determined Causes.	Water Districts.					Total.
	Torresdale.			Queen Lane.	Lower Roxborough.	
	Wentz Farm.	Main.	Oak Lane.			
Imported,	6	4	12	11	2	35
Secondary,	1	.....	.....	1	.....	2
Contacts,	.....	.....	2	2	.....	4
Contacts with river water:						
River bathers,	.....	.....	.....	2	.....	2
Worked on dredge,	.....	.....	1	.....	.....	1
Travelled on boats,	.....	.....	2	.....	.....	2
Worked on Greenwich piers,	.....	.....	1	.....	.....	1
Not typhoid fever,	.....	.....	.....	2	1	3
Doubtful diagnosis,	.....	.....	2	.....	.....	2
Possible oyster infection,	.....	.....	5	1	.....	6
Driver about town,	.....	.....	.....	1	.....	1
History incomplete,	.....	.....	.....	1	.....	1
Frequent public baths,	.....	.....	1	.....	.....	1
Contact with sewage,	.....	.....	.....	1	.....	1
Worked or visited downtown (infected water dist.),	.....	.....	9	10	4	23
Total determined causes,	7	4	35	32	7	85
Unknown,	5	5	37	22	2	71
Total,	12	9	72	54	9	156

LOWER ROXBOROUGH WATER DISTRICT.

The district next to be discussed, the Lower Roxborough, was the first in Philadelphia to be supplied with filtered water. The territory includes parts of five wards: generally speaking, the district comprises Manayunk, Falls of Schuylkill, and the lower elevations of Germantown. An estimated population of 51,000 resides in this district.

It is divided into three district sections which may be termed the Manayunk section, in the Twenty-first Ward, the Falls of Schuylkill section and the Germantown section, taking in parts of the Twenty-second, Thirty-eighth, Forty-second, and Forty-third wards respectively. Each fo these wards has at least one other water supply. Thus water is obtained from the Lower Roxborough, Upper Roxborough, and Queen Lane plants, all on the Schuylkill River and from the Torresdale plant on the Delaware River and a small section in the northern part of the Forty-second Ward gets its supply from the Springfield Water Company, a private corporation. The following table divides the wards according to the various water supplies and shows in addition typhoid fever cases occurring in the first ten months of 1913 in each ward for each water district:

POPULATION AND TYPHOID FEVER CASES IN WARDS SERVED WITH LOWER ROXBOROUGH AND OTHER WATER SUPPLIES.

Ward.	Total Population.	Estimated Population in Water Districts.						Typhoid Fever Cases, Jan. to Oct., inclusive, 1913.						Total Cases.
		Torresdale.		Queen Lane.	Springfield.	Upper Roxborough.	Lower Roxborough.	Torresdale.		Queen Lane.	Springfield.	Upper Roxborough.	Lower Roxborough.	
		Wentz Farm.	Oak Lane.					Wentz Farm.	Oak Lane.					
21,	35,406	.....	.....	.....	.....	24,000	12,000	.....	.....	.....	.....	9	9	18
38,	48,939	.....	.....	35,000	.....	.....	14,000	.....	.....	19	.....	.....	6	25
32,	70,245	.....	.....	.....	.....	53,000	18,000	.....	.....	.....	.....	12	16	28
42,	23,610	12,200	.....	.....	9,500	1,900	400	9	.....	.....	1	1	4	15
43,	43,260	15,000	9,000	12,000	.....	.....	7,000	12	6	1	.....	.....	3	22
Total, ...	221,460	27,200	9,000	47,000	9,500	78,900	51,400	21	6	20	1	22	38	108

Filtered water was first introduced into this district September 27th, 1902. One pumping station supplies both the Lower and Upper Roxborough filter plants: this is known as the Roxborough or Shawmont Station. The following facts relative to the pumping station and the filter plant are taken from the Report of the City Water Bureau for 1909.

"The Roxborough pumping station is located on the Schuylkill River near the northwestern city boundary approximately ten miles from the centre of the city. This station consists of six Worthington pumps, five with a capacity of five million gallons daily and one with a capacity of six million, five hundred thousand gallons daily; one Holly pump of ten million gallons capacity, and two Snow pumps of five million gallons daily capacity each, all horizontal compound pumps. The boiler equipment consists of eight internally fired tubular boilers of 100 H. P. capacity, and four water tube boilers of 500 H. P. capacity each."

* * * *

"The Lower Roxborough Filter Station, the first to be constructed, is located near Ridge and Shawmont Avenues, adjacent to the Lower Roxborough reservoir in the Twenty-first Ward. It is supplied from the Roxborough pumping station located at Shawmont on the Schuylkill River near the city boundary on the northwest, and consists of a sedimentation basin, eleven preliminary filters and five final or slow sand filters. The Lower Roxborough reservoir, formerly used as a storage basin, after some slight changes was converted into a subsiding basin having a capacity of about thirteen million gallons or one day's supply for the filters.

"The water is pumped into the reservoir at the bottom of the east end, and is drawn off near the surface through a screen chamber at the west end. The basin operates upon the continuous subsidence system, and will give a subsidence of the Schuylkill River water for twenty-four hours before it is passed to the preliminary filters. From the primary filters the water is passed to the plain sand filters, and thence to the clear water basin. There is no supplementary pumpage with the exception of that necessary for the purpose of cleaning the sand.

"The preliminary filters at this station consist of eleven concrete tanks, sixteen feet wide, sixty-four feet long, five feet six inches deep, inside measurements, in which is placed at the bottom five inches of coarse gravel, ranging in size from two and one-half to one and one-half inches diameter; above this a layer is crushed furnace slag, ten inches thick, ranging in dimensions from one and one-half to three-fourths inch; above this is a layer of crushed furnace slag twenty-four inches thick, ranging in dimensions from three-fourth to one-fourth inch, and above this a layer of compressed sponge, nine inches thick, weighing about five pounds per square foot of surface. The sponge is compressed on the layer of slag by a set of narrow planks spaced one-half an inch apart which are pressed down on the sponge layer by timber beams running lengthwise of the filter tank and screw jacks, reacting upwards against I beams. These beams are spaced on eight foot centres, and span the filter tanks transversely.

"The water is introduced into the bottom of the tanks through five inch diameter perforated tile pipes, percolates upwards through the gravel, crushed slag and sponge, and is drawn off at the top of the filters over brass weir plates having rectangular notches twenty-two and one-half inches long and nine inches deep.

"The water enters the filters at the rear end and is drawn off at the front end into galvanized iron boxes, from which it flows into the collecting pipe and is thence conducted to the plain sand filters.

"The preliminary filters each have a filtering area of 1,024 square feet, and when all are in service, delivering twelve million gallons per day, each will deliver 1,090,-909 gallons, or at the rate of 46.4 million gallons per acre per day.

"The filters are cleaned on an average of once a month by reversing the current at a rapid rate and washing the water into sewers through a twenty inch pipe drain at the bottom. When the sponges become heavily clogged, which occurs approximately twice annually, they are removed from the tank by mechanical appliances and washed in laundry washers driven by electric motors.

"The final filters, of which there are five in number, are of the same general type as those in use in a number of cities in Continental Europe, in Albany, N. Y., Washington, D. C., and Pittsburgh, Pa. Owing to the topography of the site, it was found necessary to locate the filters in a series of steps, the difference in level between the two adjacent filters being two feet nine inches. The filtered water basin is located at a still lower level. Each filter measures 109 feet by 219 feet 10 inches on the inside and has a net filtering area at the nominal sand line of about 0.537 acre.

"The floors of the filters are built of concrete in the form of inverted groined arches six inches thick at the centre and fourteen inches thick under the piers, and on a puddle lining. The puddle lining consists of a mixture of clay and broken stone, and is carried up around the outside walls to a point one foot above the water line of the filters.

"The vaulting is built of concrete in the form of semi-elliptical groined arches, fourteen feet span, three feet rise, six inches thick at the crown, and twenty-one inches thick over the piers, which are twenty-two inches square at the sand line and battered to thirty-four inches square at the base. Ventilator shafts are provided for the admission of light and air during scraping. On top of the vaulting is placed a layer of broken stone four inches thick for the purpose of conveying rain water to the drains leading down through the piers and dividing walls to a point just above the sand level.

"The twenty-four inch main collectors, extending the entire length of each filter, are built entirely of concrete, and are covered with movable concrete slabs. Six inch lateral collectors enter this drain at the top through special terra-cotta fittings.

"The lateral collectors are placed in each bay and consist of a line of six inch diameter vitrified pipe perforated all around from end to end and plugged at the end remote from the main collector. Around the collectors and for a height of six inches from the floor is placed gravel ranging from 3 inches to 1¾ inches in diameter. Above this is placed a four inch layer of gravel ranging in size from 1¾ to ⅝ inch diameter. On top of this a three-inch layer of gravel ranging in size from ⅝ to ¼ inch diameter is placed. On top of this is placed a two-inch layer of gravel ranging in size from ¼ inch diameter to material which would be retained on a sieve having fourteen meshes to the linear inch, and above this a final layer of one inch thick coarse sand which would pass a No. 14 sieve and be retained on a No. 20, the whole depth of the underdrain gravel being sixteen inches. Above the gravel underdrains to a depth averaging approximately thirty-six inches is placed the filter sand having an effective size of from .28 to .36 mm. with a uniformity co-efficient of about 2.5. Some of the sand was dredged from the Delaware River and some was taken from sand banks in the southern part of New Jersey.

"Each filter is provided with a regulating house in which all valves pertaining to the operation of the filters are located, also automatic effluent regulators which maintain a uniform rate of filtration regardless of the loss of head or friction through the sand which is constantly changing. Each filter is also provided with a large entrance at the court level to afford facilities for caring for the filters. The piping is of cast iron and is located in the courts or filter streets in front of the filters. The piping system consists of supply, effluent, raw water drain, refill, valve chamber drain, overflow, and pressure lines for the sand washers.

"The sand washers, two in number, are located in the court outside the filters and are of the ejector type. The washer consists of a series of hoppers thirty-six inches in diameter into which is discharged dirty sand from the filters. The sand finds its way to the bottom of the hopper and is ejected to the next hopper. The dirty water overflows from the hoppers and passes to the sewer.

"The filtered water basin is similar in construction to the filters, except that it is deeper, and the piers are twenty-two inches square for their entire height. The capacity of the basin at the nominal water line is 3,000,000 gallons. On top of the vaulting is placed a layer of puddle, filling up the depressions over the piers, with its top surface graded from a high point at the center of the basin to the four sides. On this puddle is placed a layer of broken stone, and in this four inch drains with open joints are laid to collect the rain water and lead it to the eight inch pipe around the basin and connecting with the overflow.

"This station supplies Manayunk and the lower elevations of Germantown."

Equipment for introducing hypochlorite of lime to the water was installed at this filter plant on January 26th, 1912.

Typhoid Fever in the Lower Roxborough Water District.

As in the case of the Queen Lane Water District, a detailed study of typhoid fever cases occurring in 1913 only has been made, because the changes in the water district occurring at various times in earlier years make it extremely difficult to secure definite data on the cases of former years.

The same situation obtains in this district as was found in the Queen Lane Water District, as relates to the division of the wards by the various water supplies and a detailed study has, therefore, been made of the cases occurring in 1913.

In 1913 there were thirty-eight cases of typhoid fever among 51,000 persons in the first ten months of this year. The occurrence of these cases by months and by wards is herewith shown:

TYPHOID FEVER CASES BY MONTHS IN THE LOWER ROXBOROUGH WATER DISTRICT—JANUARY TO OCTOBER INCLUSIVE—1913.

Month.	Wards.					Total Cases.
	21	38	22	42	43	
January,	0	1	2	1	0	4
February,	0	0	1	2	2	5
March,	0	0	2	0	0	2
April,	1	0	4	0	0	5
May,	3	1	2	0	0	6
June,	0	1	0	0	0	1
July,	0	0	3	0	1	4
August,	2	1	2	0	0	5
September,	3	0	0	1	0	4
October,	0	2	0	0	0	2
Total,	9	6	16	4	3	38
Case rate per 100,000 population,	75	43	88	1,000	43	74

From this table it is evident that these cases are scattered pretty generally through each month of this entire period, which differs somewhat from some of the other districts studied where a majority of the cases had their onsets during the open season.

This water district has two well defined characteristics, as the Manayunk and Falls of Schuylkill sections are largely industrial while the Germantown region is almost wholly of a superior residential character.

The next table shows the sex and age classifications of all of the cases in this district. Except for infants and those in old age, the cases are divided pretty evenly in each age period; one-half of them fall into the ten to thirty age period.

SEX AND AGE OF TYPHOID FEVER CASES OCCURRING IN THE LOWER ROXBOROUGH DISTRICT—JANUARY TO OCTOBER INCLUSIVE—1913.

Age Period.	Wards.															Total Cases.			Classification.	
	21			38			22			42			43							
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.		
0- 4,	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	0	1	1	Infants, ...	1
5- 9,	1	1	2	.....	.....	.....	2	1	3	.....	.....	.....	.....	.....	.....	3	2	5	Children, ...	5
10-14,	1	.....	1	.....	.....	.....	3	1	4	.....	1	1	.....	.....	.....	4	2	6	Minors, ...	11
15-19,	1	1	2	1	.....	1	2	.....	2	.....	.....	.....	.....	.....	.....	4	1	5	Of age, ...	8
20-24,	1	.....	1	.....	1	1	1	.....	1	.....	.....	.....	.....	.....	.....	2	1	3		
25-29,	1	.....	1	2	.....	2	.....	1	1	.....	1	1	.....	.....	.....	3	2	5	Middle age, .	13
30-34,	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	2	1	3	3	2	5		
35-39,	.....	.....	.....	1	.....	1	1	1	2	.....	.....	.....	.....	.....	.....	2	1	3		
40-44,	1	.....	1	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	1	1	2		
45-49,	.....	1	1	1	.....	1	1	.....	1	.....	.....	.....	.....	.....	.....	2	1	3		
50-+,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0	0	0	Old age, ...	0
Total, ...	6	3	9	5	1	6	10	6	16	1	3	4	2	1	3	24	14	38	.....	38

Following is a comprehensive table showing the determined causes of infection of cases in all of the wards included in this water district. This shows a total of a hundred and eight cases in the five wards involved and they are divided according to the various water supplies coming into the wards. Referring to the table it is noted that nineteen of the thirty-eight cases in the Lower Roxborough section are charged to causes outside of the water district. This was also found to be characteristic of the Belmont and Queen Lane Districts:

DETERMINED CAUSES OF INFECTION OF TYPHOID FEVER CASES IN WARDS SERVED WITH LOWER ROXBOROUGH AND OTHER WATER SUPPLIES.

Determined Causes.	Water Districts.						Total Cases.
	Torresdale.						
	Wentz Farm.	Oak Lane.	Queen Lane.	Springfield.	Upper Roxborough.	Lower Roxborough.	
Imported,	10	3	4	1	5	9	32
Secondary,	1	.....	.....	.....	.....	1	2
Contacts,	1	1	.....	.....	1	1	4
Contacts with river water:							
River bathers,	.....	.....	.....	.....	.....	3	3
Traveled on boats,	.....	.....	.....	.....	1	.....	1
Drank river water,	.....	.....	.....	.....	1	.....	1
Not typhoid fever,	.....	.....	2	.....	4	2	8
Contact with sewage,	.....	.....	1	.....	.....	.....	1
Wedding Breakfast (watercress),	.....	.....	.....	.....	1	1	2
Worked or visited down town (Infected water district),	.....	.....	3	.....	2	7	12
Total determined causes,	12	4	10	1	15	24	66
Unknown,	9	2	10	0	7	14	42
Total,	21	6	20	1	22	38	108

UPPER ROXBOROUGH WATER DISTRICT.

The Upper Roxborough district was the second in the city to be supplied with filtered water, this being effected July 3rd, 1903. This district covers a large expanse of territory lying north and west of the Lower Roxborough District and adjacent thereto, and includes parts of three wards, the Twenty-first, Twenty-second, and Forty-second respectively. The Twenty-first and Twenty-second wards also get Lower Roxborough water and the Forty-second receives, in addition to these two supplies, water from the Torresdale plant through the Wentz Farm sub-district and also from the Springfield Water Company. The best known settlements in the Upper Roxborough District are Wissahickon, portions of Manayunk, Roxborough, the higher elevations of Germantown and Chestnut Hill as well as numerous smaller communities. It is estimated that the total population residing in this district amounts to about 79,000. Taken as a whole the district is residential in character, the larger communities forming more or less high class suburbs and in addition there is considerable open country found here. The following table shows the division of this territory according to water supplies by wards and also the 1913 typhoid fever cases:

POPULATION AND TYPHOID FEVER CASES IN WARDS SERVED WITH UPPER ROXBOROUGH AND OTHER WATER SUPPLIES.

Ward.	Total Population.	Estimated Population in Water District.					Typhoid Fever Cases, Jan. to Oct., Inclusive, 1913.				Total Cases.
		Torresdale.					Torresdale.				
		Wentz Farm.	Springfield.	Upper Roxborough.	Lower Roxborough.		Wentz Farm.	Springfield.	Upper Roxborough.	Lower Roxborough.	
21.	35,466	.....	.....	24,000	12,000		.....	.....	9	9	18
37.	70,245	.....	.....	53,000	18,000		.....	.....	12	16	28
42.	30,610	12,200	9,500	1,900	400		9	1	1	4	15
Total, ...	136,321	12,200	9,500	78,900	30,400		9	1	22	29	61

The Shawmont pumping station supplies the Upper Roxborough filter plant, the following description of which is quoted from the report of the City Water Bureau for 1909:

"The Upper Roxborough Filter Station, the second to be constructed, is located north of the intersection of Port Royal and Hagy Avenues in the Twenty-first Ward, adjacent to the Upper Roxborough reservoir, which is used as a sedimentation basin, and is supplied from the Roxborough pumping station. The reservoir not having sufficient elevation to supply the filters by gravity, the water after it is passed through both basins of the reservoir is pumped to the filters by centrifugal pumps located in the extension of the Roxborough Auxiliary pumping station This station is some distance from the filters but the pumps were placed there as boiler equipment and part of the pipe system were already in place and could be utilized in connection with the operation of the Upper Roxborough filters. The station consists of eight covered sand filters, a filtered water basin and an administration building.

"Preliminary filters were not made a part of this station owing to the long period of sedimentation obtained in the Upper Roxborough basins, which have a capacity of 147,000,000 gallons, or about nine days' supply for the filters as operated at the present time.

"The topography of the site is such that the filters are all constructed on one level, with the filtered water basin situated lower.

"Each filter measures 140 feet 8 inches by 219 feet 10 inches, and has a net filtering area of 0.698 acre. The filters and filtered water basin are the same type of construction as at Lower Roxborough. The regulating houses are located at the front of the filters and each house controls two beds. The filtered water basin measures 237 feet 8 inches by 318 feet 10 inches. It is fifteen feet deep and has a capacity of eight million gallons. This station supplies the high areas in the northern part of the city, such as Chestnut Hill, Mt. Airy, Upper Germantown and Upper Roxborough.

"In the administration building are installed two duplicate pumps driven by gasoline engines to supply water to the sand ejectors and washers at a high pressure. Each pump has a capacity of 1,200,000 gallons daily against a head of 200 feet."

Chlorinated lime was first introduced into this water supply on January 27th, 1912.

As in the district last discussed, details are given only of the typhoid cases occurring during the first ten months of 1913. The onset of these cases, as well as their distribution in the three wards partly in this district, are shown in the table herewith given. It is to be here noted that all but three of the twenty-two cases occurred during the open season:

TYPHOID FEVER CASES IN THE UPPER ROXBOROUGH WATER DISTRICT, BY MONTHS—JANUARY TO OCTOBER INCLUSIVE—1913.

Months.	Wards.			Total Cases.
	21	22	42	
January,	1	0	0	1
February,	0	0	0	0
March,	0	2	0	2
April,	2	4	1	7
May,	0	2	0	2
June,	1	2	0	3
July,	3	2	0	5
August,	0	0	0	0
September,	2	0	0	2
October,	0	0	0	0
Total,	9	12	1	22

Following is a table showing the age and sex classification of the twenty-two cases. Here again the majority of cases are found falling into the age period under thirty years. The various classes are divided about evenly.

UPPER ROXBOROUGH WATER DISTRICT TYPHOID FEVER CASES—JANUARY TO OCTOBER INCLUSIVE—1913. AGE AND SEX CLASSIFICATION.

Ages	Wards. 21 M.	21 F.	21 T.	22 M.	22 F.	22 T.	42 M.	42 F.	42 T.	Total Cases. M.	Total Cases. F.	Total Cases. T.	Classification.	
0–4, ...	0	0	0	0	0	0	0	0	0	0	0	0	Infants, ...	0
5–9, ...	1	0	1	1	1	2	0	1	1	2	2	4	Children, ...	4
10–14, ...	1	1	2	0	2	2	0	0	0	1	3	4	Minors, ...	7
15–19, ...	1	0	1	0	2	2	0	0	0	1	2	3		
20–24, ...	0	0	0	1	1	2	0	0	0	1	1	2	Of age, ...	3
25–29, ...	1	0	1	0	0	0	0	0	0	1	0	1		
30–34, ...	0	0	0	2	0	2	0	0	0	2	0	2		
35–39, ...	2	0	2	0	0	0	0	0	0	2	0	2	Middle age, ...	7
40–44, ...	2	0	2	0	1	1	0	0	0	2	1	3		
45–49, ...	0	0	0	0	0	0	0	0	0	0	0	0		
50+, ...	0	0	0	0	1	1	0	0	0	0	1	1	Old age, ...	1
Total,	8	1	9	4	8	12	0	1	1	12	10	22	.....	22

The determined causes of infection in this district have been shown in a general table, which includes determined causes for cases in all of the wards involved, divided as to water supplies. In the Upper Roxborough district possible sources of infection have been given to fifteen of the cases, leaving seven of unknown origin. Seven are believed to have received their infection outside of this water district. The table in question follows:

DETERMINED CAUSES OF INFECTION OF TYPHOID CASES IN WARDS SERVED WITH UPPER ROXBOROUGH AND OTHER WATER SUPPLIES.

Determined Causes.	Water Districts. Torresdale. Wentz Farm.	Springfield.	Upper Roxborough.	Lower Roxborough.	Total Cases.
Imported, ...	4	1	5	7	17
Secondary, ...	.....	.....	.....	1	1
Contact, ...	1	.....	1	1	3
Contact with river water:					
River bathers, ...	.....	.....	.....	3	3
Travelled on boats, ...	.....	.....	1	.....	1
Drank river water, ...	.....	.....	1	.....	1
Not typhoid, ...	.....	.....	4	1	5
Infected water district, ...	.....	.....	2	3	5
Wedding breakfast (Watercress), ...	.....	.....	1	1	2
Total—Determined causes,	5	1	15	17	38
Unknown, ...	4	0	7	12	23
Total, ...	9	1	22	29	61

Summary for the Schuylkill River Water District.

The facts here set forth are more or less in the nature of summarizings. The State Health Department has collected a large amount of data concerning the Schuylkill River district, as well as the other parts of the city, and these data are available in the office of the Department and can be referred to should a more detailed report relative to this particular section of the city be desired. It is not within the province of this general report, however, to include all the information that has been secured, but an attempt has been made to cover the situation in a general way.

Summarizing the facts set forth in detail under each sub-division, it appears that from January to October inclusive in 1913, there were two hundred and ninety cases of typhoid fever in the entire Schuylkill River water district. Only fifteen per cent. of this number occurred in the first three months of the year. The remaining eighty-five per cent. had onsets during the open season, designated as April to October inclusive. This is the time when people move about more or less. using various food supplies, drinking possibly from numerous water supplies, and in fact are presumed to be in more danger of infection than when living at home. The ages of the patients should bear out this theory as it is expected that those of younger years are more active than persons in middle age. As will appear in a table to be shown hereafter over one-half of the total number of cases fall into the age period from ten to thirty. In fact seventy per cent. of the total cases are under thirty years of age. Again, from the table of determined causes of infection hereafter given, it will be noted that more than half of the total cases are presumed to have contracted the disease away from their homes and outside of the Schuylkill River Water District.

An interesting feature of the source of infection in this district relates to ten cases appearing in this table presumed to have received their infection from polluted water cress served at a wedding.

In the following tables are shown the cases occurring in the entire Schuylkill River Water District. The first shows the distribution of the cases of 1913 by months and the second the sex and age classification, the third table indicating the determined causes of infection assigned after a careful study of all the data available:

TYPHOID FEVER CASES IN THE ENTIRE SCHUYLKILL RIVER WATER DISTRICT—JANUARY TO OCTOBER INCLUSIVE—1913.

Month.	Water District.				Total Cases.
	Belmont.	Queen Lane.	Lower Roxborough.	Upper Roxborough.	
January,	3	5	4	1	13
February,	10	2	5	0	17
March,	9	2	2	2	15
April,	5	8	5	7	25
May,	9	8	6	2	25
June,	18	2	1	2	24
July,	27	9	4	5	45
August,	35	11	5	0	51
September,	33	6	4	2	45
October,	27	1	2	0	30
Total,	176	54	38	22	290

SUMMARY OF TYPHOID FEVER CASES—JANUARY TO OCTOBER INCLUSIVE — 1913 — ENTIRE SCHUYLKILL RIVER WATER DISTRICT.

Sex and Age Classification.

Ages.	Water District.												Total Cases.			Classification.	
	Belmont.			Queen Lane.			Lower Roxborough.			Upper Roxborough.							
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.		
0-4,	2	2	4	1	1	2	0	1	1	0	0	0	3	4	7	Infants,	7
5-9,	9	13	22	1	1	2	3	2	5	2	2	4	15	18	33	Children,	33
10-14,	8	11	19	4	5	9	4	2	6	1	3	4	17	21	38	Minors,	86
15-19,	23	12	35	3	2	5	4	1	5	1	2	3	31	17	48		
20-24,	12	13	25	8	4	12	2	1	3	1	1	2	23	19	42	Of age,	82
25-29,	19	5	24	5	5	10	3	2	5	1	0	1	28	12	40		
30-34,	10	5	15	1	0	1	3	2	5	2	0	2	16	7	23		
35-39,	6	6	12	2	0	2	2	1	3	2	0	2	12	7	19	Middle age,	71
40-44,	7	2	9	2	3	5	1	1	2	2	1	3	12	7	19		
45-49,	2	2	4	3	0	3	2	1	3	0	0	0	7	3	10		
50+,	2	5	7	1	2	3	0	0	0	0	1	1	3	8	11	Old age,	11
Total,	100	76	176	31	23	54	24	14	38	12	10	22	167	123	290		290

DETERMINED CAUSES OF INFECTION OF TYPHOID FEVER CASES IN THE ENTIRE SCHUYLKILL RIVER WATER DISTRICT.

Determined Causes.	Water District.				Total Cases.
	Belmont.	Queen Lane.	Lower Roxborough.	Upper Roxborough.	
Imported,	43	11	9	5	68
Secondary,	2	1	1	.....	4
Contacts,	8	2	1	1	12
Not typhoid,	5	2	2	4	13
Contact with river water:					
River bathers,	2	2	3	.....	7
Travelled on boats,	5	.....	.....	1	6
Worked on Greenwich Pier	1	.....	.....	.....	1
Drank river water,	3	.....	.....	1	4
Infected water district,	44	10	7	2	63
Contact with sewage,	2	1	.....	.....	3
Cobbs Creek bather,	2	.....	.....	.....	2
Wedding Breakfast (water cress infection),	8	.....	1	1	10
Polluted spring water,	1	.....	.....	.....	1
Polluted well water,	3	.....	.....	.....	3
Possible oyster infection,	.....	1	.....	.....	1
Driver about town,	.....	1	.....	.....	1
History incomplete,	.....	1	.....	.....	1
Total determined causes,	129	32	24	15	200
Unknown,	47	22	14	7	90
Total,	176	54	38	22	290

Water Sampling By the City and State Health Department in the Schuylkill River Water District.

The water supply of the Schuylkill River Water District is obtained wholly from the Schuylkill River. Here the first city water filtration plants were built and from the beginning the operation of the plants has been successful and the results as a whole satisfactory from a bacteriological standpoint. When filtered water was first introduced into this district, sampling stations were established by the city in different parts of the section. In this district no such change of quality was observed as the water passed through the distributing system as has been shown to take place in the Torresdale filter plant supply. Because of the stability in quality of the water here, district sampling stations have to a great extent been abandoned, so that at the present time the bacteriological work is confined to the filtration plants and a few sampling stations. In the following tables are given the results of analyses of samples examined at the Belmont Laboratory from January 1st to the end of September, 1913. The results obtained from each sample are not given, but the number of samples collected during each month are shown, together with the number of samples of one cubic centimeter and of ten cubic centimeters that, on a presumptive test, indicated B. Coli. The only variation in this work is in the analyses of raw water when B. Coli presumptive tests are made by using one-tenth cubic centimeter and one cubic centimeter instead of one cubic centimeter and ten cubic centimeters as in the case of filtered water.

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.
Intake-Belmont Pumping Station.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		0.1 c. c.	1.0 c. c.
January,	31	27	31
February	28	17	25
March,	31	23	29
April,	30	17	27
May,	31	15	22
June,	30	18	29
July,	31	15	25
August,	31	22	29
September,	30	22	27

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Upper Roxborough Water—Tap in Auxiliary Pump Station.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
January,	31	0	0
February,	28	0	0
March,	31	0	1
April,	30	0	0
May,	31	0	0
June,	30	0	1
July,	31	1	1
August,	31	0	1
September,	30	0	1

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Upper Roxborough Water-Tap at 530 Leverington Avenue.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
July,*	11	0	0
August,	13	0	0
September,	13	0	0

*First sample dated July 7th.

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Lower Roxborough Water-Filtered Water Basin.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
January,	31	0	3
February,	28	0	0
March,	31	0	2
April,	30	0	3
May,	31	0	0
June,	30	0	1
July,	31	0	1
August,	31	0	4
September,	30	0	2

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Lower Roxborough Water-Tap at Green Lane and Fox Streets.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
June,*	3	0	0
July,	13	0	0
August,	13	0	0
September,	13	0	0

*First sample dated June 25th.

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Belmont Water—Filtered Water Basin.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
January,	31	0	8
February,	28	0	1
March,	31	1	1
April,	30	0	1
May,	31	0	0
June,	30	0	1
July,	31	0	1
August,	31	0	1
September,	30	1	1

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Belmont Water-Tap at South Fortieth and Chestnut Streets.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
May,*	2	0	1
June,	13	0	1
July,	12	0	0
August,	13	0	0
September,	12	0	2

*First sample dated May 26th.

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Belmont Water-Tap at 6137 Vine Street.

Month.	No. Samples Analyzed.	No. Samples showing B. Coli.	
		1 c. c.	10 c. c.
May,*	2	0	0
June,	13	0	1
July,	12	0	4
August,	13	1	4
September,	12	0	4

*First sample dated May 26th.

CITY RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Queen Lane Water—Filtered Water Basin.

Month.	No. Samples Analyzed.			No. Samples showing B. Coli.					
	General Filtrate.	North Basin.	South Basin.	General Filtrate.		North Basin.		South Basin.	
				1 c. c.	10 c. c.	1 c. c.	10 c. c.	1 c. c.	10 c. c.
January,	18	13	13	2	2	1	8	3	5
February,	21	7	7	0	0	0	1	0	6
March,	22	9	9	0	4	1	3	1	6
April,	17	13	13	0	1	1	8	2	4
May,	0	31	31	.....	.....	1	7	1	8
June,	0	30	30	.....	.....	0	2	0	4
July,	0	31	31	.....	.....	0	3	0	3
August,	0	31	31	.....	.....	0	1	0	3
September,	0	30	30	.....	.....	0	1	0	3

Because of the satisfactory condition of this supply and the comparative absence of typhoid fever in this district, the State Department of Health collected only a few samples. The results as a whole were satisfactory. In the following table is given the result of analysis of each sample:

STATE RESULTS—SCHUYLKILL RIVER WATER DISTRICT—1913.

Raw Water Samples.

Collecting Point.	Bacteria per c. c.	B. Coli per c. c.
Belmont Pump Station,	44,000	540
Belmont Pump Station,	41,000	540
Queen Lane Pump Station,	88,500	3,800
Queen Lane Pump Station,	67,500	3,200
Shawmont Pump Station,	54,400	1,080
Shawmont Pump Station,	54,700	2,400

Upper Roxborough Filter Plant Supply.

Collecting Point.	Bacteria per c. c.	B. Coli per c. c.
Tap—7616 Ridgway Avenue,	8	0
Tap—Andora School,	3	0
Tap—C. A. Wray, Res., 305 Highland Ave., Chestnut Hill,	7	0
Tap—Chas. Clark, Res., Lincoln Drive & Harter St.,	3	0

Lower Roxborough Filter Plant Supply.

Collecting Point.	Bacteria per c. c.	B. Coli per c. c.
Tap—J. M. Adams & Co., Main & Dupont Sts., Manayunk,	22	0
Tap—Imperial Woolen Mills, Main & Rector Sts., Manayunk,	13	0
Tap—Littlewood Mills, Main St. & Walnut Lane, Manayunk,	120	0
Tap—S. Lindermuth, Res., 15th & Rockland Sts.,	75	0
American Pulley Co., 4200 Wissahickon Ave.,	100	0
Tap—Power, Weightman & Rosengarten, Main & School Sts.,	5	0
Tap—John Vages Cafe—Wayne Ave & Berkley St.,	13	0

Belmont Filter Plant Supply.

Collecting Point.	Bacteria per c. c.	B. Coli per c. c.
Tap—60th & Market Sts.,	50	1
Tap—S. 46th & Chestnut Sts.,	86	0
Tap—Barber Asphalt Co., 245 N. 30th St.,	60	1
Tap—Atlantic Refining Co., N. 30th St. below Spring Garden St.,	25	0
Tap—P. F. Fairlamb Co., 115 S. 30th St.,	20	0
Tap—American Ice Co., S. 30th St. & Spruce St.,	48	0
Tap—Penna. Reduction Co., S. 49th St. & Schuylkill Riverr	80	0
Tap—Gulf Refining Co., S. 58th St. & Schuylkill River,	50	0

Queen Lane Filter Plant.

Collecting Point.	Bacteria per c. c.	B. Coli per c. c.
Tap—A. T. Reiff, Saloon, N. 17th St. & Allegheny Ave.,	35	1
Tap—Robinson & Crawford, Store, N. 16th St. & Ontario Ave.,	31	0
Tap—Frederick Dueble, N. 39th St. & Dauphin St.,	80	0

Dual Pipe Connections in the Schuylkill River Water District.

The industries in this water district are mainly confined to the river front, in the Belmont district chiefly north and south of and close to Market Street, and in the Lower Roxborough district along the river front in Manayunk. In the first group there are fourteen plants among which three were discovered to have dual pipe connections. In the upper group there are twenty-one plants with eleven having dual pipe connections.

In the lower group dual connections were discovered at the plant of the Consolidated Dressed Beef Company, North Thirtieth and Race Streets, at the D. B. Martin Company, Thirtieth and Market Streets, and at the West Philadelphia Yards of the Pennsylvania Railroad Company, North Thirtieth and Race Streets. At the Consolidated Dressed Beef Company's plant a hundred and fifty men are employed and supplies of well water and river water are used for cooling purposes, with the river water also used for fire lines. The city water is used for drinking and industrial purposes. There was a six inch connection between the river pumps and the city distributing system in which a check valve was placed. With the pumps operating in the fire lines a pressure of a hundred and ten pounds was obtained, the city pressure being forty pounds. A complicated arrangement of piping existed at this plant, but the company, at the orders of the city authorities, made arrangements to separate the city lines from those carrying the raw river water.

The plant of the D. B. Martin Company is an abattoir where city water was used for drinking and boiler purposes. River water was also used in the fire mains and for condensing purposes, being pumped to two tanks on the roof. There was a priming line between the two systems. This company complied with the requirements of the city relative to severing connections between the two systems.

At the West Philadelphia Yards of the Pennsylvania Railroad a six inch connection existed between the city system and the fire lines, a valve and meter being placed between the city system and the fire pump, which, when operating, raised the pressure of the river water to a hundred and ten pounds, the city pressure being much lower. There was also a six inch city connection—pressure fifteen pounds—feeding a reserve water supply and another six inch city connection to the boiler house, connecting to the fire line. A valve and a check valve existed on two of these lines and a valve was put on the third line. Corrections were required to be made here within fourteen days, by the City Board of Health on October 1st, 1913.

Eleven plants with dual connections were found in the Upper Schuylkill section in the vicinity of Manayunk. The one farthest down stream is the Robert Hay & Sons Woolen Goods Mill on Main Street, Manayunk. Here a six inch pump suction extended to the river and a four inch discharge connected directly to a four inch city fire main. Between this connection a check valve with a drip was put in as a temporary measure of precaution.

Next up stream is the Littlewood Dye Mills on Main Street below Walnut Lane in Manayunk. Here there are two six inch suction lines from the canal to the mill pump with the discharge leading to the reservoir, which also received water from the city line. The city water was further used in emergencies for boiler feeding. At this plant the city pressure was a hundred and twenty-five pounds and the plant pressure about eighty pounds. A check and a drip were put in between the connection and the plant was passed temporarily by the city authorities subject to a future definite policy respecting these dual connections.

A short distance up stream from this mill is the plant of the American Bridge Company at Walnut Lane and Main Street, where a six inch city water fire line feed connects direct to a six inch raw water pipe, with a valve and a check intervening. A blank flange was put in this cross connection and the two supplies in this manner separated.

At the plant of the Imperial Woolen Mills, corner of Main and Rector Streets, Manayunk, raw river and city water were used, the city water here having a pressure of a hundred and thirty pounds. The raw water is used for fire purposes and the city water for the boilers and in emergency for drinking and manufacturing. The information is not definite as to the remedial measures carried out at this mill.

Near at hand are the McDonnell Paper Mills at the rear of Leverington Avenue and Main Street, Manayunk, where there is a six inch connection between the city system and the raw river water system, both of which are connected with the sprinkler system. In the mills two check valves had been placed and in August, 1913, the city authorities required the mill owners to put in a drip between the two checks.

The Ripka Mill Company is located at the corner of Main and Carson Streets, Manayunk. Through an eight inch suction to the canal the sprinkler system in the mills was supplied. From the pumps three connections were maintained between with the city mains, namely, a four inch fire line, a three inch hose line and an inch and a half supply line for general use. The river water supply has a pressure of eighty pounds and the city water a pressure of about a hundred and twenty-five pounds. One valve shuts off the entire raw water supply from that of the city. The only chance of contamination here would be when the city pressure dropped to eighty pounds at which time it would be equalled by the pressure of the raw water supply.

At the plant of the Philadelphia Hydro-Electric Company, Umbria Street and Schuylkill River, there was a small connection between the river and the city supply. This was severed.

The William Spink Mills at Nixon Street and River Road, Manayunk, at the time of the typhoid fever outbreak, in 1913, maintained a four inch city line in the plant for fire purposes. There was also an inch and a quarter city supply line on the boiler feed pump, which also had a three inch suction to the canal but this was disconnected.

At the National Waist Mill, Nixon and Leverington Streets, a two inch and a half suction pipe extended from the boiler feed pump to the canal and to this pump there was an inch and a half connection to the city system. This connection was broken.

At the Wabash Carpet Mills, located at the same place, there was a connection between the city mains and the boiler feed pumps, which also use raw water. There were two four inch city lines, one to the sprinklers and another for general use. From the latter the connection to the boiler feed pump was made. This cross connection was allowed to remain subject to further orders, with a drip placed between the valve and the check in the cross connecting line.

Regarding the remaining plant having a dual pipe connection, namely, the dyeing plant of C. R. Simister & Son, at Nixon and Umbria Streets, no definite information is available.

Orders were issued at these various plants, requiring certain alterations to be made to conserve the purity of the city water supply and these were carried out as already stated. Where temporary measures were permitted it was with the understanding that further requirements might be laid on the owners when a definite policy was determined upon by the city authorities with respect to the dual water connections. From the results of analysis of water taken in this district it is not apparent that the dual connections had any material effect upon the quality of the water served through the city pipes.

SUMMARY AND CONCLUSIONS REGARDING THE TYPHOID FEVER OUTBREAK IN THE CITY OF PHILADELPHIA.

In the entire city from January to October, inclusive, 1913, there were 1,529 cases of typhoid fever. The details respecting these cases, and the separation of them as to localities by wards and water districts have already been carried out in the various sectional reports. It remains to summarize and draw conclusions and possibly formulate recommendations based on the results obtained.

The figures gathered are shown in concise form in tables that are to follow. In this summary, as was done in the sectional reports, the city has been divided according to the various water districts, this method being a convenient one and also entering materially into the discussion of the epidemic. The first table gives the record of typhoid fever cases for the entire city for a period of thirteen years—1901 to 1913, inclusive—the cases for the last mentioned year being given for the first ten months only. In this table the number of cases only, are given, without any attempt at distribution, and a study of the same clearly indicates that there has been a marked decrease in the number of typhoid fever cases during this period. It is safe to say that much of this can be attributed to the general use of filtered water throughout the city. Prior to 1909, when the Torresdale supply was put in service, the case rate was quite high, but beginning with this year and in the years following, a very material reduction in the number of cases ensued. At this time practically the entire city was furnished with filtered water:

SUMMARY OF TYPHOID FEVER CASES FOR THE ENTIRE CITY 1901-1913 (INCLUSIVE).

For 1913, January to October, Inclusive, Only.

Year.	Cases.	Year.	Cases.
1901,	3,750	1908,	3,562
1902,	5,017	1909,	2,441
1903,	8,691	1910,	1,745
1904,	6,613	1911,	1,377
1905,	6,181	1912,	1,514
1906,	9,746	1913,	1,529
1907,	6,719		

The distribution of the 1,529 cases for 1913 is next shown. Here the cases are separated as to the months of onset and as to the geographical distribution by water district, the population of the various districts also being shown:

SUMMARY OF TYPHOID FEVER CASES BY MONTHS FOR THE ENTIRE CITY BY WATER DISTRICTS—JANUARY TO OCTOBER INCLUSIVE—1913.

Month.	Water Districts.										
	Torresdale District.				Schuylkill River District.						
	Frankford and Wentz Farm.	Kensington.	Central and South Phila.	Oak Lane.	Belmont.	Queen Lane.	Lower Roxborough.	Upper Roxborough.	Springfield.	Cases outside water districts.	Total for city.
January,	6	12	25	5	3	5	4	1	.....	.....	61
February,	2	19	19	1	10	2	5	0	.....	.....	58
March,	2	12	20	4	9	2	2	2	.....	.....	53
April,	0	30	45	7	5	8	5	7	.....	.....	107
May,	3	42	102	11	9	8	6	2	.....	.....	183
June,	6	55	97	11	18	2	1	3	.....	.....	193
July,	8	63	115	13	37	9	4	5	1	.....	245
August,	9	78	119	25	35	11	5	0	.....	2	284
September,	7	55	92	25	33	6	4	2	.....	1	235
October,	2	33	41	14	27	1	2	0	.....	.....	120
Total,	45	399	675	116	176	54	38	22	1	3	1,529
Population, 1910 census,	87,800	334,000	423,400	190,000	247,000	104,000	51,400	78,900	9,500	18,000	1,544,000

Considerable attention has been paid in the sectional report to the occurrence of the cases and it has been shown that, generally speaking, the cases have been more numerous during what has been termed the open season of the year, designated as from April to October inclusive. This is shown in tabular form for the cases of the entire city for a six year period 1908 to 1913 inclusive. For the last four years of the period thus shown it is notable that the open season cases predominate, this being particularly true for 1913 where eighty-eight per cent. of all the cases occurring during the first ten months of the year had their onsets during the open season of the year. This is significant when compared with the determined causes of infection, which table will follow later and from which it is seen that nearly fifteen per cent. of the cases contracted the disease outside of the city. The table showing the open season cases is given below:

Summary of Typhoid Fever Cases for the Entire City for Six Years During the Open Season—April to October Inclusive.

Cases.	1908	1909	1910	1911	1912	1913
Total cases,	3,562	2,441	1,745	1,377	1,514	1,529
Open season cases,	1,745	1,203	1,033	870	851	1,357
Per cent. of total,	49.0	49.3	59.2	63.2	56.2	88.7

Much time was expended in an effort to determine the causes of infection of the cases studied. In many instances efforts along this line were unavailing. Often the data respecting the case were meagre, this being particularly true with reference to the cases occurring in the earlier months of the year. In some instances, indeed, there was scarcely any information of value of determining a possible source of infection. Later, after the arrival of the State Health Department officers, this condition was bettered somewhat so that towards the close of the investigation each case was more thoroughly canvassed, with the result that it was possible to arrive at a probable source of infection in a great many more cases than could be done with those occurring earlier in the year. At the instigation of the State Health Department officers many of the cases were re-investigated by the City Medical Inspectors and this often was productive of good results. It is believed that, as a result of the State investigation, cases occurring hereafter will be more thoroughly gone into because of the training the Medical Inspectors secured, mainly because of the insistence of the State Department of Health's officers on accurate and exhaustive information.

After a careful study of all the available data, the following summary has been compiled showing the determined causes of infection of typhoid fever cases occurring in the entire city during the first ten months of 1913. These are separated as to water districts and the same general classification is here employed that was used in the sectional reports. Of the 1529 cases, causes of infection have been assigned to 645, leaving 884 cases of unknown origin. The summary is shown in the subjoined table:

DETERMINED CAUSES OF INFECTION OF TYPHOID FEVER CASES IN THE ENTIRE CITY BY WATER DISTRICTS—1913—JANUARY TO OCTOBER INCLUSIVE.

Determined Causes of Infection.	Water Districts.										
	Torresdale District.				Schuylkill River District.						
	Frankford and Wentz Farm.	Kensington.	Central and South Phila.	Oak Lane.	Belmont.	Queen Lane.	Lower Roxborough.	Upper Roxborough.	Springfield.	Cases outside water district.	Total cases.
Imported,	17	36	69	22	43	11	9	5	1	.....	213
Secondary,	1	16	59	.....	2	1	1	.....	.....	1	81
Contacts,	1	18	33	8	8	2	1	1	.....	.....	72
Not typhoid,	1	.....	2	.....	5	2	2	4	.....	.....	16
Contact with river water:											
River bathers,	1	1	17	1	2	2	3	.....	.....	.....	27
Travelled on river boats,	.....	4	6	3	5	.....	.....	1	.....	.....	19
Worked on Greenwich piers,	.....	.....	3	1	1	.....	.....	.....	.....	.....	5
Worked in Cramps Shipyards,	.....	8	.....	1	.....	.....	.....	.....	.....	.....	9
Drank river water,	.....	10	10	.....	3	.....	.....	1	.....	.....	24
Wharf laborers,	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	6
Worked on dredge,	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Otherwise,	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	3
Infected in down town water district,	.....	4	.....	12	44	10	7	2	.....	1	80
Contact with sewage,	.....	2	.....	.....	2	1	.....	.....	.....	.....	5
Cobbs creek bather,	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2
Wedding breakfast (watercress infection),	.....	.....	.....	.....	8	.....	1	1	.....	.....	10
Polluted spring water,	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1
Polluted well water,	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3
Possible oyster infection,	.....	5	1	5	.....	1	.....	.....	.....	.....	12
Driver about town,	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
History incomplete,	.....	.....	.....	1	.....	1	.....	.....	.....	.....	2
Doubtful diagnosis,	1	.....	3	2	.....	.....	.....	.....	.....	.....	6
Stetson's employees,	.....	1	8	.....	.....	.....	.....	.....	.....	.....	9
Handling laundry,	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Possible pre1ze1 infection,	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2
Ritz milk,	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	3

DETERMINED CAUSES OF INFECTION OF TYPHOID FEVER CASES IN THE ENTIRE CITY BY WATER DISTRICTS—1913—JANUARY TO OCTOBER INCLUSIVE—Continued.

Determined Causes of Infection.	Water Districts.										
	Torresdale District.				Schuylkill River District.						
	Frankford and Wentz Farm.	Kensington.	Central and South Phila.	Oak Lane.	Belmont.	Queen Lane.	Lower Roxborough.	Upper Roxborough.	Springfield.	Cases outside water district.	Total cases.
Possible neighborhood infection,	.....	15	8	.....	.....	.....	.....	.....	.....	.....	23
Frequented public baths,	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Bathed in ponds,	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Contact at work,	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	7
Determined causes,	22	133	229	58	129	32	24	15	1	2	645
Unknown,	23	266	446	58	47	22	14	7	0	1	884
Total,	45	399	675	116	176	54	38	22	1	3	1,529

STUDY OF THE PREVALENCE OF TYPHOID FEVER IN 1913 IN DISTRICTS OF PENNSYLVANIA IN THE VICINITY OF PHILADELPHIA.

In connection and coinciding with the work of the State Department of Health in Philadelphia relative to the epidemic of typhoid fever there was carried on an investigation as to the prevalence of typhoid fever, during the first ten months of 1913, in the metropolitan district comprising Philadelphia and the densely populated territory in its vicinity, in both Pennsylvania and New Jersey. An effort was made to determine if the cause of infection in cases occurring in this district could be charged to the city.

The data following refer to typhoid fever patients at points in Bucks, Montgomery, Chester, and Delaware Counties within a radius of thirty miles from Philadelphia, whose dates of onsets were between January 1st, 1913 and November 1st, 1913, and who at some time within thirty days prior to the given onset visited in Philadelphia.

The corrected list shows that of 490 cases studied sixty-two or 12.7 per cent. were in all probability infected in Philadelphia.

They were distributed as follows:

County.	Cases.
Bucks,	7
Montgomery,	18
Chester,	21
Delaware,	16
Total,	62

Of the sixty-two cases:
50 were reported in boroughs.
12 were reported in second class townships.

The use of water, either while visiting in or at work in Philadelphia, could not be accurately determined for the reason that persons who had been ill prior to taking the census were frequently absent and it was impossible to see patients who were ill at the time of the census. The assumption that Philadelphia water was the probable means of infection is substantiated by the sex of the patients, seventy-six per cent. of them being males, who are more frequently in transit; and, by the age periods, as eighty-five per cent. of them were over fifteen, and, for that reason, more likely to travel. A table showing age and sex of all cases follows:

TABLE SHOWING AGE AND SEX OF TYPHOID FEVER CASES POSSIBLY ATTRIBUTABLE TO INFECTION IN PHILADELPHIA.

Ages.	Male.	Female.	Total.
0- 4,	0	1	1
5- 9,	2	3	5
10-14,	3	0	3
15-19,	10	2	12
20-24,	9	1	10
25-29,	6	3	9
30-34,	6	1	7
35-39,	4	0	4
40-44,	1	1	2
45-49,	2	1	3
50 or over,	4	2	6
Total,	47	15	62

Those excluded from the appended list are Nos. 32, 35, 38, and 39, who were probably infected by eating water cress obtained outside of the city limits; No. 56, a nurse probably infected by a patient under her care; and No. 68 who was exposed to milk infection in Sellersville.

The available data respecting each case are noted on the tabulation sheets following:

TYPHOID FEVER CASES OCCURRING IN PENNSYLVANIA NEAR PHILADELPHIA IN 1913 WITHIN THIRTY DAYS AFTER A VISIT TO PHILADELPHIA.

Case No.	Borough or Township.	County.	Date of Onset.	Sex.	Age.	Use of Water.		In Other Places.	Remarks.
						Visits.	Works.		
1	Rutledge,	Delaware,	January 4,	M.	36		12th & Sansom.		
2	Moreland Twp.,	Montgomery,	January 25,	F.	17	8th & Market.			
3	Swarthmore,	Delaware,	February 1,	M.	49	Various places,		Brooklyn.	
4	Norwood,	Delaware,	February 12,	F.	8	Shopping district.			
5	Easttown Twp.,	Chester,	February 20,	F.	31			Brooklyn and Atlantic City.	
6	Clifton Heights,	Delaware,	March 14,	M.	11	South Philadelphia.			
7	Bristol,	Bucks,	March 20,	M.	16	6th & Carpenter.			
8	Westtown Twp.,	Chester,	March 30,	M.	31	?,		West Chester.	
9	Bensalem Twp.,	Bucks,	April 1,	M.	19	9th & Market.			
10	Downingtown,	Chester,	April 3,	F.	21	?,		Norfolk, Va.	
11	Kennett,	Chester,	April 10,	M.	17	?.			
12	Bristol,	Bucks,	April 10,	M.	30	8th & Carpenter,			
13	Jenkintown,	Montgomery,	April 18,	F.	6	10th & More,			Died.
14	Doylestown,	Bucks,	April 20,	M.	55	Shopping district.			
15	L. Salford Twp.,	Montgomery,	April 24,	M.	31	1st & Spring Garden.			
16	Prospect Park,	Delaware,	April 28,	M.	14	?,		Chester.	
17	Sadsbury Twp.,	Chester,	May 1,	M.	42	?,	Coatesville.		
18	W. Chester,	Chester,	May 5,	F.	27	?.			
19	Tredyffrin Twp.,	Chester,	May 14,	M.	19	7th & Carpenter.			
20	E. Whiteland Twp.,	Chester,	May 14,	M.	23	8th & Carpenter.			
21	Jenkintown,	Montgomery,	May 20,	F.	5	13th & Chestnut.			
22	Hatboro,	Montgomery,	May 22,	M.	11	11th & Chestnut,		Parkesburg.	
23	E. Downingtown,	Chester,	May 25,	M.	45	?,		Chester, Wilmington, & Pen Grove.	
24	Jenkintown,	Montgomery,	May 26,	F.	9	Shopping district,		Hatboro.	
25	Hatfield,	Montgomery,	June 1,	M.	59	Del Riv. to Broad St. on Market.			
26	Westchester,	Chester,	June 1,	M.	21	Lenape Park.			
27	Hatboro,	Montgomery,	June 11,	F.	22		9th & Chestnut.		
28	West Chester,	Chester,	June 14,	M.	32	11th & Market.			
29	Pocopson Twp.,	Chester,	June 15,	F.	23	?,		Kennett Square.	
30	Franconia,	Montgomery,	June 22,	M.	22	Chestnut Hill,		Allentown.	
31	S. Bradford,	Chester,	June 28,	M.	36	?,		Oxford and Camden, N. J.	
32	Jenkintown,	Montgomery,	July 1,	F.	24	1254 S. 51st St.,		Jenkintown,	Watercress from W. Chester.
33	Bristol,	Bucks,	July 1,	M.	27	?.			
34	Coatesville,	Chester,	July 1,	M.	32	?,	Coatesville.		
35	Lansdale,	Montgomery,	July 4,	M.	38	Shibe Park,			Watercress from W. Chester.

36	Lansdowne,	Delaware,	July 4,	F.	25	?.				
37	Hatboro,	Montgomery,	July 4,	M.	19	Bus. Sect. E. of Broad.				
38	Swarthmore,	Delaware,	July 6,	F.	21	?,			Brunswick, Me.	
39	Swarthmore,	Delaware,	July 7,	M.	34	1234 S. 51st St.,			Avalon, Wildwood, & Ocean City.	Water cress.
40	Swarthmore,	Delaware,	July 7,	F.	30	1234 S. 51st St.,			Avalon, Wildwood, & Ocean City.	Water cress.
41	W. Whiteland Twp.,	Chester,	July 10,	M.	18	?.				
42	Swarthmore,	Delaware,	July 11,	M.	8	1234 S. 51st St.,			Avalon & Ocean City.	
43	Ridley Park,	Delaware,	July 12,	F.	4	?,			Ocean City & Chester.	
44	E. Rock Hill Twp.,	Bucks,	July 15,	F.	16	906 N. 21st St.				
45	Bristol,	Bucks,	July 26,	M.	21	Bus. Sect. E. of Broad.				
46	Hatfield,	Montgomery,	July 30,	F.	39	1723 S. Broad,			New York City.	
47	Hatboro,	Montgomery,	August 1,	M.	8	Kensington.				
48	Coatesville,	Chester,	August 4,	M.	20	?,			Atlantic City.	
49	E. Bradford,	Chester,	August 5,	M.	70	Gettysburg,	Worked and boarded with case No. 31.			Died.
50	North Wales,	Montgomery,	August 6,	M.	28		34 S. 16th,		Delaware Water Gap.	
51	Bridgeport,	Montgomery,	August 9,	M.	15	?.				
52	Hatboro,	Montgomery,	August 10,	F.	48	Kensington.				
53	Darby,	Delaware,	August 15,	F.	50	West Philadelphia.				
54	E. Downingtown,	Chester,	August 15,	M.	26	?,			Wilmington.	
55	Norwood,	Delaware,	August 18,	F.	44	Shopping district,			Albany & New York.	
56	Ridley Park,	Delaware,	August 20,	F.	19	Shopping district,			Probably secondary to her own patient.	
57	Jenkintown,	Montgomery,	August 20,	M.	38	Jenkintown,	Juniper & N. Penn Sq.			
58	Norwood,	Delaware,	September 1,	M.	18		31st & Chestnut.			
59	Hatboro,	Montgomery,	September 3,	M.	15	Shibe Park.				
60	Aston,	Delaware,	September 5,	F.	21	West Philadelphia,			Chester & Wilmington.	
61	Bridgeport,	Montgomery,	September 9,	M.	33	?.				
62	Norwood,	Delaware,	September 12,	F.	28	?,			Ocean City.	
63	Coatesville,	Chester,	September 12,	F.	28	Shopping district,			New York and West Chester.	
64	West Chester,	Chester,	September 14,	F.	54	Shopping district.				
65	Lansdowne,	Delaware,	September 15,	M.	17	Various points,			Atlantic City.	
66	Moore,	Delaware,	September 21,	M.	22	71st Street,				P. R. R. fireman.
67	Oxford,	Chester,	October 17,	M.	25	?.				
68	Sellersville,	Bucks,	October 25,	M.	34	?,				Exposed to infection by milk.

TYPHOID FEVER IN NEW JERSEY—NEAR PHILADELPHIA.

A detailed study has also been made of the occurrence of typhoid fever during 1913 in that portion of New Jersey within a radius of approximately thirty miles from Philadelphia, the purpose of which was to determine the relation, if any, between the prevalence of typhoid fever in Philadelphia and its occurrence in neighboring districts on that side of the Delaware. The study was confined to three counties within a thirty mile radius including all of Camden County, nearly all of Gloucester County, and over half of Burlington County, It is of interest to note that all of the cases reported from these counties to the New Jersey State Board of Health occurred within the thirty mile limit, although the extreme portion of Burlington County is about fifty miles distant from Philadelphia.

This study was made with the consent and cooperation of the New Jersey State Board of Health which supplied the Pennsylvania Health Department with all its available data concerning cases reported. A census of every case was taken by representatives of the Pennsylvania State Department of Health, and the following report is based upon data so obtained, including all the cases, 221 in number, whose onsets occurred between January 1st and about September 15th, 1913.

Two hundred and twenty-one cases of typhoid fever occurred in the three counties of New Jersey now under consideration, viz: Burlington, Camden, and Gloucester Counties. Of this number it was ascertained that one hundred and forty had no connection with Philadelphia. The remaining eighty-one cases had some connection with Philadelphia whereby they may have become infected with typhoid fever. Nineteen of these eighty-one cases were regularly employed in Philadelphia. In the following table is shown the probable origin of the 221 New Jersey cases studied:

SUMMARY OF ORIGIN OF TYPHOID CASES FOR THREE COUNTIES IN NEW JERSEY—JANUARY TO SEPTEMBER, 1913.

Origin.	Burlington County.	Camden County.	Gloucester County.	Total Cases.
Cases Having no Philadelphia Connections.				
Unknown,	31	36	10	77
Secondary,	5	3	1	9
Imported,	4	13	4	21
Polluted wells,	2	3	6	11
Bathing in river or creek,	2	8	1	11
Gloucester city water,	....	9	....	9
Polluted shellfish,	....	1	....	1
Raw Delaware river water,	....	1	....	1
Total,	44	74	22	140
Cases Having Philadelphia Connections.				
City water,	10	28	9	47
Steamboat,	1	2	....	3
Secondary,	1	7	1	9
Oysters,	1	....	....	1
Unknown,	2	2	2	6
Water cress,	....	1	....	1
Secondary to Philadelphia typhoid,	....	2	....	2
Unknown secondary,	....	1	....	1
Imported,	....	1	....	1
Polluted wells,	....	4	....	4
Gloucester city water,	....	6	....	6
Total, Philadelphia connections,	15	54	12	81
Total, no Philadelphia connections,	44	74	22	140
Total, New Jersey cases,	59	128	34	221

The distribution by counties of the eighty cases having connection with Philadelphia, and the months in which the onsets occurred, appear in the following table:

NEW JERSEY TYPHOID CASES HAVING CONNECTIONS WITH PHILADELPHIA, SHOWING MONTH OF ONSET IN THREE COUNTIES.

County.	Population, 1912.	Total cases.	January.	February.	March.	April.	May.	June.	July.	August.	September. (part).
Burlington,	68,981	15	1	1	2	1	1	2	5	1	1
Camden,	149,573	54	3	1	3	5	7	5	13	14	3
Gloucester,	38,427	12	0	0	1	0	2	4	2	3	0
Total,	256,981	81	4	2	6	6	10	11	20	18	4

It is significant that among the cases having connections with Philadelphia the greater number occurred during May, June, July, and August, corresponding approximately to the greatest prevalence of typhoid in Philadelphia.

CONCLUSIONS: The detailed study of the facts summarized above indicates that of the large number of cases which occurred in New Jersey, in the neighborhood of Philadelphia, the source of infection of a great proportion was probably in Philadelphia and suspicion points strongly in most cases to polluted city water.

RECOMMENDATIONS.

As a result of the detailed study of the outbreak of typhoid fever in Philadelphia, involving as it did a comprehensive survey of the city's water supply and water works system, certain recommendations may be made respecting the water works system which, if carried out, it is believed will result in greater efficiency and lead to a greater degree of purity in the public water supply. Even during the investigation some of these recommendations were made orally to officials of the Water Bureau and were received by them with approbation. The complete series of recommendations follows:

The old mud deposits in the Wentz Farm reservoir should be removed, the reservoid disinfected, and again put in commission. Furthermore, this reservoir should be covered to prevent algous and other organic growths which now cause seasonal deterioration of the water.

The need of enlargement and improvement of the Wentz Farm high service pumping station, standpipe, and system is imminent and the present is the proper time to consider these extensions and improvements, plans for which should be prepared and submitted to the State Department of Health for approval.

Additional storage capacity for Torresdale filtered water should be obtained by an enlargement of the Wentz Farm reservoir or at some other place.

The city should collect and analyze at least hourly samples of the water at the Torresdale filtered water basin and at Lardner's Point pumping station.

Moreover, the city should prepare plans, to receive the approval of the State Department of Health, for an improvement in the method of pre-treating the water at the Torresdale plant prior to its delivery to the sand filters, this improvement among other things to include sedimentation of the raw water in order that the yield of the sand filters may be increased and the growing needs of the city met without prejudice to public health. In this connection the use of a coagulant at the filtration plant should be considered.

The chemical disinfection of the filtrate at the Torresdale plant is necessary at present, but, as soon as it is safe so to do, the constant use of the disinfectant should be discontinued, although the apparatus for introducing a disinfectant into the filtrate should be kept in readiness for an emergency.

The apparatus for applying the chlorinated lime to the filtered water should be improved to assure perfect contact between the disinfectant and all of the filtered water; plans for this should be submitted to the State Department of Health for approval.

Apparatus for disinfecting the water in case of an emergency should be installed at the Lardner's Point pumping station and plans for the same should be prepared and submitted to the State Department of Health for approval.

The dry chamber on the raw water emergency intake at Lardner's Point pumping station should be constantly maintained in a dry condition.

The city authorities should forthwith clean out all deposits in the Corinthian reservoir. Furthermore, a permanent disinfecting plant should be installed at this reservoir and the application of the disinfectant here should be continuous under responsible supervision whenever it becomes necessary.

The South Philadelphia District contains very large areas of undeveloped and unoccupied territory. Many hundred acres of land are subject to inundation or would be if it were not for the maintenance of dykes and tide-water gates. There is a plan ultimately to fill in this low land as a part of the development of a larger port of Philadelphia. If these plans which are now being shaped are carried out it will open up for improvement within two and one-half miles of City Hall a district of about ten square miles. There is no area with such possibilities within such a short distance of the centre of any other American city. It is within the bounds of probability that the population of South Philadelphia will be trebled in the next ten years, that is that by the year 1925 over one million people will be resident in South Philadelphia. This means that not only the system of water distribution will be materially altered from what it is now and extended, but that large sums of money must be invested in utilizing the source of supply.

The project of laying a new water conduit along the Delaware River front from Lardner's Point pumping station to League Island Navy Yard has already been given some consideration by engineers of the city and in this connection the project has also been considered of laying a new supply main from the Torresdale filter plant to an additional and new pumping station for distribution purposes to be located along the banks of the Delaware River somewhere between Market Street and the Frankford District and in support of this project it is urged that the entire city should not be required to depend for its supply of water upon one tunnel from the Torresdale filter plant and one pumping station, as now at Lardner's Point. If this system is to be continued, very extensive additions must be made at Lardner's Point and a new tunnel or conduit must be provided from Torresdale to the pumping station. Furthermore, the capacity of the Torresdale filter plant must be increased very materially. It is held by very astute, experienced engineers to be a wrong principle to rely entirely on one pumping plant. For instance, if an accident should occur, as the blowing out of boilers, it is better to have two pumping stations, one auxiliary to the other, so that the entire service of the city would not be interrupted, and for analogous reasons it is held to be better in the extension and enlargement of the water works system that the South Philadelphia water district shall be supplied by independent mains and an independent pumping station. Furthermore, in connection with this proposed development, additional storage capacity as an auxiliary to the pumping station is needed.

It is, therefore, suggested that the city should forthwith take up the consideration of the plans for supplying the Central and South Philadelphia water districts with an adequate supply of pure water and that these plans be studied in connection with the development of the Kensingtown water district and the Torresdale filtration works.

Trouble is also experienced at the Belmont and Queen Lane filter plants at times of high turbidity of the Schuylkill River water. The facilities for sedimentation are not always sufficient to relieve the preliminary filters of the abnormal load placed upon them at such times, and in consequence not only the preliminary filters but the secondary filters become overtaxed and the quality of the water supplied to the public deteriorates.

The preliminary filters are not of modern design and they do not perform their work efficiently or sufficiently. Important changes and improvements are needed and in this connection the water should be thoroughly settled before going to the preliminary filters and facilities should be provided for the use of coagulants at such times as the raw water may need to be treated in this manner prior to filtration.

During the summer of 1913 the water at all of the Schuylkill River district plants was treated with a disinfectant as an additional safe guard and permanent plants for this treatment were being installed.

The subject is worthy of some investigation and these investigations can best be carried forward by men employed to do nothing else, but until this be done it is recommended that the city be advised to employ experts to make tests and to determine the most practicable way in which to treat the Schuylkill River water prior to its final purification in the sand beds and to submit these plans to the State Department of Health for approval.

In the Queen Lane district but not a part of it, is a large storage reservoir known as East Park reservoir. A large amount of sediment is reported to be deposited here and it should be removed. Tests of the water collected by both the city and the Department show that there is a deterioration in the quality of the water stored in this reservoir and this is attributed partly to the organic matter accumulated on the bottom of the basins.

In general the reservoirs of the water works system of the city were built prior to the introduction of filtered water into the city and in most of them the crest of

the embankment slopes toward the inside of the reservoir facilitating drainage into the basin. Public walks are in some instances carried on the top of the embankment. At all of the reservoirs the city should either provide drainage facilities adequate to prevent contamination of the waters therein from surface drainage, or place the fences around the reservoirs at a sufficient distance therefrom to exclude the public from the slopes draining to the basin.

It is advised that the Water Bureau continue its observation of the quality of the water at the several stations with a view to enabling it to determine how and where best to carry out the remedies suggested.

Under existing conditions absolute safety can be attained only by boiling the Torresdale filtered water whenever it is to be used for drinking. A general warning on this subject would serve to protect the public. Particularly should such a warning be issued, and at once and in emphatic terms, whenever any distinct deterioration in the quality of the water occurs.

APPENDIX I—WATER SUPPLY ON THE WHARVES, DOCKS, AND FERRY AND OTHER BOATS.

During the investigation of this outbreak of typhoid fever in 1913, the question of the water supply at the wharves, docks, and ferries, and also on the various craft plying on the rivers was carefully considered. Sixty-seven of the typhoid patients of this season had employment on boats or piers where they were likely to drink river water, or, in a few instances, were passengers on river boats where the drinking water was subject to contamination. The information gathered on this point is contained in the report which follows.

At the wharves, docks, and ferries along the Delaware and Schuylkill Rivers in Philadelphia 24,800 men are daily employed in the various pursuits common to shipping and navigation. Six thousand of these employees work along the Schuylkill and 18,800 work along the Delaware River front. On the Delaware twenty-seven piers have no water supply and a hundred and forty-two have a water supply. Ten of the latter are furnished with river water only, three have river and well water, and eighty-three have river and city water, making a total of ninety-six using more or less raw river water, relative to which some degree of menace to health must exist. Forty-six of the piers use city water only.

At fifty-nine piers on the Delaware River city water is supplied to vessel for domestic uses. Fifteen of these piers use city water only and the remainder have both city and raw river water. Of these remaining forty-four piers, using both city and raw river water, are the twelve at the Cramp's ship-yard. Here city water is furnished to the vessels for drinking and raw river water is supplied for steaming purposes when the steamship leaves the dock. Placards printed in six different languages are placed where the men might get raw river water for drinking, warning against this practice. From the forty-four piers using both city and raw water there may be deducted twenty-five piers at the Port Richmond Terminals of the Philadelphia and Reading Railway Company. Eight of these twenty-five are large, extending out to the Port Warden Line and here water is regularly supplied from the city mains free of charge to the steam-ships. Seventeen of these are short piers where coal barges and smaller vessels dock. It is inconvenient to get at the city water hydrant here because it is at the bulkhead line. Nevertheless barge casks are sometimes filled at these hydrants and in the aggregate much of this water must be consumed for drinking purposes, although raw Delaware River water is preferred. This leaves seven piers along the Delaware River, using both city water and river water, that supply vessels with city water for drinking.

On the Schuylkill River there are fifty-seven bulkheads or wharves. Four of them have no water supply, two are not in use, leaving fifty-one that have water. Of these fifty-one using water, one has artesian well and river water, one has river water only, and twenty-four have both city water and river water. Twenty-five use city water only. At one of the latter places the city water is refiltered for drinking. At three of the twenty-four wharves using both city and river water the river water is filtered for industrial purposes, and one pier has recourse to a spring on the premises and the water is used for manufacturing processes.

At six of the wharves along the Schuylkill River city water is supplied to vessels At fifty-one of the wharves no water whatsoever is furnished.

Inquiries made at the fifty-one wharves as to where the vessels secured drinking water brought out these responses: at fourteen wharves the vessels were said to obtain their water from water boats; at four wharves it was said that the canal boats get their supply from the canals above Reading; at thirty-two wharves it was stated that the barges get their water raw from the Delaware River, and at one wharf it was reported that the barges take on water at the Richmond and Greenwich piers.

Along the Delaware River, docking at the different piers, there are ten river steamboats engaged in freight transportation, and eleven passenger steamboats from which the drinking water has been sampled and analyzed by the State Department of Health. Out of fourteen samples from the freight boats eight showed B. Coli in one cubic centimeter. Three of these were Philadelphia. City water, two were raw Delaware River water, one Salem City water, one Smyrna water, and one Trenton City water. Out of eleven samples from the passenger steamers, two showed B. Coli. One was Salem City water (it contained 300 B. Coli) and the other was Trenton City water. A table giving the results of these analyses is appended.

These river steamboats, with a few exceptions, pay little or no regard to the water supply. The water barrels are ill-kept. Carelessness obtains in bringing the water aboard in buckets and through hose. The drinking cups are dirty and dipping up the water is necessary under the arrangements. Dirty ice is sometimes rinsed in the river at the dock and then put into the drinking water. Raw river water is supplied to wash stands. Further analyses would probably reveal more bacteriological evidence condemnatory of these practices.

On the wharves and piers as a rule little attention is bestowed to the subject of supplying the dockmen with pure water. Raw river water is too available. The facilities for getting city water are not as convenient as they should be.

RESULTS OF ANALYSES OF DRINKING WATER ON DELAWARE RIVER STEAMBOATS.

Steamboat.	Service.	Bacteria Per CC.		Water Supply.
		Total Count.	B Coli.	
	ON TEN FREIGHT STEAMBOATS			
Riverside,	Philadelphia and Chester,	300	1	Philadelphia City.
		240	0	Philadelphia City.
		600	0	Philadelphia City.
		2,400	8	Delaware river.
Tinicum,	Philadelphia and Chester,	250	0	Chester City.
Admiral,	Philadelphia and Mt. Holly,	2,400	2	Philadelphia City.
		1,500	0	Philadelphia City.
City of Salem,	Philadelphia-Salem-Baltimore,	8,000	1	Salem.
Frankie,	Philadelphia and Smyrna,	600	2	Smyrna (well).
Greensborough,	Phiadelphia and Milford,	900	20	Delaware river.
Alice,	Philadelphia-Chester-Wilmington,	1,800	0	Wilmington.
Christina,	Philadelphia-Chester-Wilmington,	1,500	0	Wilmington.
West River,	Philadelphia-Chester-Wilmington,	1,000	1	Philadelphia City.
F. W. Brune,	Philadelphia and Trenton,	450	40	Trenton City.
	ON ELEVEN PASSENGER STEAMBOATS.			
Adelaide,	Philadelphia-Salem-Baltimore,	6,000	300	Salem.
Prospect,	Philadelphia and Bridgeton,	16,000	0	Delaware river.
Clio,	Philadelphia and Odessa,	240	0	Odessa (well).
Ericsson,	Philadelphia and Baltimore,	40	0	Philadelphia City.
Anthony Groves, Jr.	Philadelphia and Baltimore,	1,200	0	Baltimore City.
Frederica,	Philadelphia and Frederica,	200	0	Frederica (well).
City of Wilmington.	Philadelphia and Wilmington,	100	0	Wilmington.
City of Philadelphia.	Philadelphia and Wilmington,	15	0	Wilmington.
Springfield,	Philadelphia and Trenton,	6,000	0	Delaware river.
Twilight,	Philadelphia and Trenton,	6,000	4	Trenton City.
Bristol,	Philadelphia and Trenton,	2,700	0	Trenton City.

On October 1st, 1913, John A. Vogelson, President of the City Board of Health, Carlton A. Davis, Chief of the City Water Bureau, John Meigs, Assistant Director of the Department of Wharves, Docks, and Ferries, Dr. W. G. Stinson, Passed Assistant Surgeon, representing in Philadelphia the Federal Public Health Service, a Lieutenant of the United States Revenue Service of the Port of Philadelphia, and F. Herbert Snow, Chief Engineer of the State Health Department, boarded the patrol boat of the Department of Wharves, Docks, and Ferries, to make an inspection of river conditions. During the course of this investigation the party boarded one of the water boats and inspected it. This vessel in company with several others is engaged exclusively in the sale of drinking water to craft of all kinds. It was found here that the pump and hose attachment used for delivering water from the boat to the vessel are the same pump and hose that are used for pumping raw Delaware River water in which to wash down the decks, and the pump further supplies the boiler on the boat with raw river water. The water cylinder may be filled with river water at the time the pump is started to raise the city water from the water boat to the water storage tank on the vessel to which

the supply is being given, thus making it possible and practically unavoidable to pollute the water delivered to the vessel. Furthermore, it was found that this same pump can draw water directly from the river and deliver it to the purchaser if the captain should so elect and it is generally understood that some of the water boat captains make a practice of mixing the raw river water with the city water. Before the city supplied filtered water oftentimes the raw Delaware river water was less turbid than the water available in the city mains and even now this condition sometimes obtains. It appears to be the practice that if a water boat were hailed by a vessel and it had only a little water in its tanks the deficiency would be made up by drawing directly from the river. The captain of the water boat visited by the party insisted that he never followed this practice because he would suffer loss of reputation in business but he admitted that there was nothing to prevent it being done on his boat if his orders were disobeyed or if he chose, for any reason, to depart from this rule. He did not hesitate to state that some of the other water boats at times supplied a mixture of city filtered water and the raw river water to vessels.

It was obvious that in order to protect the public health it would be necessary to compel water boats to have separate apparatus, one for handling drinking water and another to be used for other purposes.

The question arose as to how best to regulate the matter and whether the Federal Government, the State or the city should act. It would appear that the city could shut off the supply of water to the water boats or the supply of it to the municipal piers free of charge as the case might be, unless the apparatus on the water boat for the storage and handling of the water were acceptable to the city. Furthermore, the City Board of Health might establish rules and regulations compelling the adoption of proper apparatus and requiring that the city should furnish water only to such water boats as were licensed—this license being issued only when proper apparatus was provided—and city inspectors could follow up a system of examinations on the boats and analyze the water.

It is recognized that such a regulation would not reach a case where a water boat obtained its supply from a point out of the city, for instance Camden, or where the captain chose to take raw water from the Delaware, as such boats would be outside the jurisdiction of the city of Philadelphia. To obviate this difficulty would probably require the adoption of uniform regulations relative to the supply by both the states of Pennsylvania and New Jersey.

It might furthermore be necessary for the Federal Government to exercise its authority in the case of river steamboats and other vessels engaged in furnishing drinking water and drawing it from the Delaware River, thus menacing the public health. Possibly the regulation covering such matters as relate to interstate traffic might be applicable in such cases.

The port of Philadelphia needs, among other things, ample facilities that will assure a pure drinking water at all of the wharves, docks, and ferries to boats engaged in business along the Delaware and Schuylkill Rivers. This involves a supervision of the facilities afforded for the obtaining, storage, and distribution of the water. The dipping cup utensil should be abolished. The placing of ice in contact with the water should be prohibited. Pumps, hose, buckets, and other apparatus used in connection with the drinking water service, should be exclusively used for this purpose, whether on water boats or vessel of any kind, or on the wharves and piers. It should be compulsory for all owners or operators of wharves, docks, ferries, and boats to provide pure water for drinking purposes in containers of approved pattern. All places where employees might obtain raw river water with ease should be placarded with warning signs. The dual system of piping which permits the use of drinking water or raw river water at choice through the manipulation of valves, that is now condemned so far as the physical connection with the city mains is concerned, should be condemned in any plant located on shipboard. The two systems of piping should be separate.

There follows a detailed recitation of the facts secured by the State Department of Health's investigation as to the water supply at the wharves, docks, and ferries, and those incidental to vessels docking along both the Delaware and Schuylkill River in the city of Philadelphia. By far the greater portion of the shipping trade is to be found in the Delaware River and here are located the large wharves or piers which extend some distance out into the stream. Many vessels dock here annually, some being engaged in river trade, others in the coast-wise trade, while still other vessels are employed in the transatlantic shipping business. There are numerous ferry boats plying back and forth as well as various tugs and lighter river craft.

The traffic on the Schuylkill River is more or less of an industrial type and the wharves here are usually merely bulkheads. The depth of this river moreover, prevents access thereto by the larger vessels.

The piers along the Delaware River are numbered in series, one series beginning at Market Street and extending southerly almost to the mouth of the Schuylkill River, another series extending north from Market Street to Port Richmond, beyond which there is a third series extending northerly to the city line.

At present the first series comprises sixty-five piers, the second seventy-six, and the third twenty-eight piers, making a total of one hundred and sixty-nine piers along the Delaware River. The south wharves will be discussed first The existing piers are described in order.

SOUTH WHARVES.

Pier No. 1 is owned by the estate of William J. Thompson and is leased by the Porter-Gildersleeve Company, a general contracting firm engaged in the collection at the pier of dry refuse material, such as ashes and dirt used for filling purposes chiefly in the low lands in the southern part of Philadelphia. No offal nor wet refuse is accepted. All operations are supervised by the City Board of Health. Four men work at the pier, these being negroes or Italians. One chartered tug and six scows called deck-lighters comprise the shipping outfit. There is no city water on this pier but a hand pump at the end of the wharf is used to raise the river water for sprinkling the dry material to lay the dust. The employees on the pier have access to the river water if they should desire to drink it, but drinking water is carried in buckets to the pier from places near at hand.

Drinking water for the tug is obtained where convenient mostly from the city mains, perhaps from the municipal piers. Between eight in the morning and six in the evening city water may be secured by tugs at the municipal wharves located at the foot of Vine Street and at the foot of Washington Avenue. It is understood that no charge is made for this city water. Notwithstanding this fact, it is credibly reported that probably eighty-five per cent. of the tug boats get their drinking water from the upper and lower reaches of the Delaware River in preference to bothering with the municipal supply. If the city piers were kept open at all hours perhaps the Tug Boat Association might be more successful in compelling obedience to the rule to supply city water only for drinking purposes on tug boats. The deck-lighters owned by this company are operated without a crew and have no water supply.

Pier No. 3, owned by the Philadelphia and Baltimore Steamship Company, is occupied by five lessees, namely, the Atlantic Fruit Company, the United States Government, Frederica-Philadelphia Navigation Company, the Milford Navigation Company, and the Ericsson Line.

The pier has city water for drinking and fire purposes, but the fire hydrant is not on the end of the pier out in the river but near the office and bulkhead line. The city water service is metered. When the fire lines are used the city must be notified. Approximately two hundred stevedores work on the wharf and the water for drinking purposes is drawn from the fire hydrants.

The Atlantic Fruit Company has a line of six vessels engaged in the fruit business between Philadelphia and the West Indies. No city water is supplied to these vessels for drinking. It is not definitely known just where these vessels get their water supply in their northern port, but it is known that they secure a drinking water supply at their southern ports.

The Federal Government has dockage rights at this pier for its revenue cutter engaged in river work in the vicinity of Philadelphia. City water from the mains on the pier is used to supply this vessel.

The Frederica-Philadelphia Navigation Company has a steam boat known as the Frederica engaged in river and passenger freight business between Philadelphia and Frederica, in Delaware below Wilmington. Two round trips a week are made but passengers are rarely taken aboard. The drinking water for this vessel is always obtained from an artesian well at Frederica and is brought aboard in buckets and put in a barrel placed aft on the main deck. This barrel is equipped with a faucet. Manufactured ice from Chester is also placed in the barrel. A sample of water was taken from the barrel on October 24, 1913, which upon analyses at the State Health Department laboratory showed in one cubic centimeter a total count of 200 bacteria with no B. Coli. The danger on this vessel apparently lies in obtaining and storing the water. There is reason to believe that the buckets used for carrying the drinking water on board are at times made use of for general purposes on deck and may be contaminated with raw river water. The placing of ice in the water is another menace.

The Milford Navigation Company has but one boat, the Greensborough, engaged in freight business between Philadelphia and Milford, Delaware. The drinking water is obtained from the Delaware River at any place where it is clearest, the water being dipped up in buckets and poured into a barrel which is open at the top and kept aft on the upper deck. Ice is placed in this barrel occasionally, there is no faucet and the water has to be dipped out of the barrel. A sample from this barrel collected on October 24th, 1913, showed a total bacterial count of 900 with 20 B. Coli in one cubic centimeter.

The Ericsson Line has four steamboats only two of which were in service at the time of the investigation, namely, the Ericsson and the Anthony Groves, Jr. This company is engaged in passenger and freight business between Philadelphia and Baltimore. The steamer Ericsson has a steel water tank in the hold with a pump located in the galley. This tank is filled either with Baltimore or Philadelphia city water. Water coolers are located at convenient points about the boat and ice is placed therein and drinking cups are provided. The danger here, excluding any that might exist in the original supplies, is in the possibility of contamination of the water in the coolers through contact with impurities on the ice and through the use of the common drinking cup. During the course of the Department's inspection gross carelessness in handling the ice at some of the piers was observed. At one of the wharves the ice was dragged across the dirty wharf, split up into small pieces and placed by the dirty hands of the deck-

men in the water container. In one case at least a thirty-five pound piece of ice was dipped in the river to cleanse it of mud after which it was placed in a water cooler. A sample collected at the pump on October 18, showed in one cubic centimeter a total of forty bacteria with no B. Coli.

The Anthony Groves, Jr., of the Ericsson Line has a small steel tank in the hold fitted with a pump and, in addition, a barrel placed horizontally on the forward deck. A hole has been knocked in the barrel and through this water is dipped. On this boat also the city supplies at Baltimore and Philadelphia are used and the containers are filled either by hose or buckets, whichever is most convenient. The hose may also be used for inferior purposes. On October 19th, two samples were collected on this boat, one from the barrel and this upon analysis showed in one cubic centimeter a total bacterial count of 30,000 with two B. Coli, and another sample from the pump which showed a total count of 1,200 bacteria with B. Coli absent. In both instances the water was the Baltimore city supply.

From the foregoing it appears that at Pier No. 3, providing the city water is pure, the danger to the public lies in the handling of the water after it is drawn from the mains.

Pier No. 5 at the foot of Chestnut Street, owned by the city of Philadelphia, is double decked. The upper deck is used for recreation purposes and the lower deck is leased by two concerns, namely, the Wilmington Steamboat Company and the Delaware River Transportation Company. City water is the only supply on the pier, and is used for all purposes except in the office where bottled water is furnished. About twenty hands are employed on the lower deck, but during the summer time a maximum of six hundred persons visit the pier daily for recreation purposes.

The Wilmington Steamboat Company, otherwise known as the Wilson Line, is engaged in passenger and freight business between Philadelphia and Wilmington, Delaware, and intermediate points. There are four boats, two in service, each boat making two trips daily. They are named the City of Wilmington and the City of Philadelphia, and are sister ships, duplicates in all details including water supply. Placed on the upper deck is a steel tank which is filled with water at Wilmington, Delaware, from the municipal supply which is filtered Brandywine Creek water. No Philadelphia water is used. From the storage tank the water is conducted by gravity to the foot of the stairway in the main saloon where there is an ice cooler consisting of a coil pipe about which the ice is placed The cooler is equipped with a faucet and there is also a bubbling fountain. Individual paper drinking cups are available. On October 20th, a sample was collected at the faucet on the City of Wilmington which contained in one cubic centimeter a total count of 100 bacteria and no B. Coli. On October 24th, a sample was collected at a faucet on the City of Philadelphia which contained a total count of 1,500 bacteria and no B. Coli in one cubic centimeter.

The Delaware River Transportation Company is engaged in passenger and freight business between Philadelphia and Trenton, and intermediate points. At the time of investigation, three of their four boats were in commission, namely, the Springfield, Bristol, and Twilight.

The Springfield obtains its supply of drinking water from the Delaware River at a clear spot opposite Florence, New Jersey. The water is bucketed and poured into a barrel placed vertically on the rear lower deck and provided with a faucet. Artificial ice is put into the water in this barrel and a common drinking cup is supplied. On October 18th, a sample was obtained from this faucet. It contained in one cubic centimeter a total count of 6,000, B. Coli were absent. It is needless to say that this supply is a menace to public health.

The Bristol has a similar barrel on the lower deck aft. Trenton City water is used exclusively and ice is placed in the barrel. Provided the Trenton water is pure the danger of contamination of the barrel water lies in possible contamination through contact with dirty ice. A common drinking cup is provided on this boat and on the Springfield. On October 21st, a sample was collected here and contained a total count of 2,700 with no B. Coli present in one cubic centimeter.

The Twilight is supplied with the same water in exactly the manner obtaining on the Bristol. On October 20th, a sample was collected from the faucet. The total count was 6,000 and four B. Coli were present in one cubic centimeter.

Next down stream are the ferry slips of the Philadelphia and Reading Railway Company. There are thirty men employed on the pier and on the boats. For the steam heating plant on the pier raw river water is supplied by a small pump which has no connection with the city mains. City water is used for drinking purposes and to supply the fire lines, the latter being separate from the drinking water pipes. There is no water supplied for the public on the ferry boats, but the crews are provided with Camden city water kept in buckets. On all of the boats raw river water is used for washing down decks and for boiler purposes and, if the employees so choose, they can drink this water, but it is not as handy on the ferries as the drinking water supplied in the buckets.

Pier No. 8 is at the Chestnut Street freight station and is owned by the Philadelphia and Reading Railway Company, having 250 men employed. The business conducted here is the transfer of freight cars and approximately a hundred barges are employed in this work. On these, freight cars are loaded and transferred back and forth by tugs to Camden and various freight transfer stations along

the river. The tugs, four in numbers, do not dock at this point. They are supplied with drinking water at the Port Richmond wharves from the city mains. On Pier No. 8 city water is the only supply for all purposes except in the office where bottled water is used. The drinking water lines are on meter and are separate from the fire pipe lines. Raw river water is not in use on the pier for any purpose.

Pier No. 9 is owned by E. T. and A. D. Warner and is leased by the George W. Bush and Sons Company of Wilmington, Delaware, which operates the Warner Line for freight business only between Philadelphia and Wilmington with a stop at Chester. On the pier thirty men are employed. Bottled water is used at the office, but otherwise the city water supply is furnished and used for drinking purposes, there being no fire lines. From this wharf, three steamboats run regularly each day. A tug and two barges for handling extra freight complete the outfit. The boats are named Alice, Christina, and West River.

The Alice uses mainly the city of Wilmington public supply and occasionally some Philadelphia city water. There is a small cask placed on the upper forward deck which is filled with water brought on board in buckets, ice being put into the cask. There is a common drinking cup provided and the water has to be dipped from the cask. A sample collected October 20th from the cask showed a total bacterial count of 1,800 with no B. Coli in one cubic centimeter.

Water is supplied on the Christina in exactly the same manner. A sample collected here on October 18th, showed a total bacterial count of 1,500 with no B. Coli in one cubic centimeter.

The steamer West River is furnished with Philadelphia water secured from Pier No. 9. On this boat there is a barrel fitted with a faucet on the upper after deck and into this ice is put. On the lower deck there is a second barrel with the top open and from this the water has to be dipped. A sample was collected on October 21st, from the faucet at the upper barrel. This contained a total bacterial count of 1,000 with one B. Coli in one cubic centimeter.

The menace to the purity of the water supply on these three boats lies in the manner in which the water is stored and also the method of bringing it aboard in buckets which may possibly be used for other and inferior purposes.

Piers Nos. 10, 11, and 14 are at the foot of Walnut Street and are owned by the Pennsylvania Railroad Company. These are transfer stations only and no vessels dock here. From here freight cars are transferred to the other stations of the railroad company along the river. There are seven tugs engaged exclusively in this business. They dock at Greenwich Point. None of the barges employed has a crew, but a hundred and twenty-five men are employed at the piers. Bottled water is supplied in the office and otherwise the water supply about the wharves is that from the city mains, no river water being used for any purpose. The drinking water lines and the fire lines are separate and fire hydrants are scattered over the piers.

Pier No. 16, owned by the city, is between Dock and Spruce Streets and was only partly completed at the time of the Department's investigation.

Piers Nos. 18 and 20 are between Spruce and Pine Streets and are owned by the Boston and Philadelphia Steamship Company. The Merchants and Miners Transportation Company is the lessee and operates steamship lines between Philadelphia, New York, Boston, Savannah, Jacksonville, and points in the Carribbean Sea for both passengers and freight. Only their own vessels, eleven in number, dock at these piers where a hundred and fifty men are employed. River water is not used for any purpose here, but the city water is supplied for drinking and fire purposes, the lines being separated. Through the drinking water lines water is furnished to the vessels which also take water at other stopping points. Bottled water is furnished to the office on the pier. At the time of the investigation a fire hose was used for delivering the water from the pier to the vessels but at the suggestion of the State Department of Health the company proposes using a special hose, lettered "drinking water hose," to supply vessels. Details as to the storage and distribution of water on the vessels were not secured.

Pier No. 22 is near the foot of Pine Street and is owned by the Baltimore and Ohio Railroad Company. It is a transfer station for freight cars similar to those of the Pennsylvania and the Philadelphia and Reading Railroads, previously described. Over one hundred barges are used in connection with this work and there are two tug boats which dock at the Jackson Street wharf, Pier No. 81 south wharves. The Merchants and Miners Line vessels tie up at this wharf for the transfer of freight only. Thirty men are employed on the pier and there is no river water used for any purpose, but the city water is supplied for fire and drinking purposes with the lines kept separate. In addition bottled water is furnished at the office. At this pier no water is supplied to any vessels.

Pier No. 24, owned by the Baltimore and Ohio Railroad Company, is leased and operated by the Merchants and Miners Transportation Company for their Savannah and Jacksonville freight steamships which vessels also carry passengers. Pier No. 24 is used, however, only for the transfer of freight and on it one hundred men are employed. The vessels docking here take water from the city mains which is the only water supply on the pier. There are drinking water and fire mains here but they are not connected.

At the foot of South Street are two ferry slips, one of which is the Delaware River Ferry Company operated between Philadelphia and Kaighns Point, New

Jersey, by the Philadelphia and Reading Railway Company, and the other is the Gloucester Ferry Company operating between Philadelphia and Gloucester, New Jersey.

At the slip and on the boats of the Delaware River Ferry Company, twenty-four men are employed. No river water is used but city water is supplied for fire and drinking purposes through separate lines and also for heating purposes. Two boats constitute the service. Water for public consumption is not supplied, the boatmen using water, kept in buckets, obtained from the New Jersey side of the river.

At the Gloucester Ferry Company slips, there are three ferry boats and sixteen men employed at the slip and on the boats. Philadelphia city water is the only supply at the slip. On the ferry boats, prior to about the middle of September, water drawn from a tap in the waiting room in the slip was supplied to the coolers and iced during the summer, but this practice was discontinued about the middle of September on account of the prevalence of typhoid fever in Philadelphia attributed by some at this time to an infected public water supply. There were two cases of typhoid fever among the deck hands on one of the ferry boats. Raw river water is used for washing down the decks and for boiler purposes on all of the boats, and it is reported that the men at times use this supply for bathing purposes. On October 18th, a sample was collected from the city water tap at the Gloucester Ferry Station, Philadelphia, which upon analysis, was found to contain a total bacterial count of 250 with no B. Coli present in one cubic centimeter. At the foot of South Street where these ferry slips are located there is an eight foot city sewer discharging into the river.

Pier No. 28 is owned by the Franklin Sugar Refining Company and leased by the Independent Pier Company. Tramp steamers may purchase dockage privileges here. Raw river water pumped from the sugar plant is used on this pier for fire service, no drinking water being available except that brought on by buckets from the city service near by, a water boy being engaged for this purpose. There is no city water furnished on the pier, where one hundred men are employed at times. The tramp steamers docking at this wharf are obliged to get their water from river water boats or elsewhere.

Piers Nos. 30, 31, 32 and 33 are owned by the Franklin Sugar Refining Company, and any vessel may purchase dockage privileges here. There is no water of any kind at these piers nor are any men regularly employed.

Pier No. 34 owned by the Philadelphia and Reading Railway Company is leased by the Independent Pier Company and operated by the latter which acts as general agents at this port for the North German-Lloyd Steamship Company and the Austro-American Line. Tramp steamers also dock at this wharf on which at times two hundred men are employed. City water is used on the pier for all purposes, the drinking and fire protection lines being separate and there is no river water supplied for any purpose.

The Independent Pier Company in connection with the pier operates three tugs known as the Active, Neptune, and Triton, these last two being combined tugs and water boats and furnish water to the ocean liners and tramp steamships docking at the pier and possibly to other vessels anchored in the river. It is not convenient for these water boats to secure water at Pier No. 34, and the supply is obtained from the city mains at the municipal piers at Vine Street, Penn Treaty Park, and Washington Avenue respectively.

Pier No. 35 is near the foot of Fitzwater Street, owned by the Philadelphia and Reading Railway Company, leased by the Independent Pier Company, and maintained for general dockage purposes and used by tramp steamships. There are no regular employees here and no water supply.

Piers Nos. 36, 37, and 38 have been purchased by the city and the first two were being demolished at the time of the investigation. Pier No. 38 was in use in 1913, while the city was completing a new Pier No. 38, which was put in operation in the fall of 1913. The old pier was used by the Philadelphia and Reading Railway Company as a freight transfer station similar to its other transfer wharves previously described. It had no general water supply but there was a small pipe connection from the city main to the office to furnish a supply of drinking water both in the office and about the pier, water for the latter purpose being carried in buckets from the office. Approximately one hundred and fifty men have been employed here and the tug boats in service at this pier dock at Port Richmond.

At the new municipal Pier No. 38 city water is supplied for all purposes, the drinking water lines being separate from the fire service lines. No drinking water will be supplied to vessels of any description and the pier has been leased by the Philadelphia and Reading Railway Company and is to be operated as a freight transfer station.

Pier No. 39 is owned and operated by the American Ice Company, the only vessels docking here are those loaded with ice from the rivers in Maine and the Hudson River. City water is supplied on the pier for drinking purposes, there being no fire protection and the vessels purchase drinking water elsewhere, presumably from the water boats.

Pier No. 40 lately purchased by the City of Philadelphia, was, during the season of 1913, leased and operated by the Philadelphia Harbor Transfer Com-

pany. Here ten men are employed. There is no water supply on the wharf and the employees bring their drinking water in buckets from faucets on the city system nearby. This pier is to be demolished and replaced by a new one.

Pier No. 41, owned by the Pennsylvania Railroad Company, has been condemned by the city and presumably was vacated November 1st, 1913. During the season the wharf was leased by the Southern Steamship Company and eight of this company's steamships dock here. They ply between Philadelphia and southern points and are engaged in the freight business only. On the wharf forty men are employed and city water only is supplied, one pipe line furnishing water for drinking purposes and fire protection. The city water supply was also furnished to steamships at this pier. These boats get an additional supply at other ports. The southernmost port of the line is Porth Arthur, Texas.

Piers 43 and 44, owned by the Pennsylvania Railroad Company, have been closed during the summer of 1913, and were in the process of demolition. They will be replaced by new piers by the city of Philadelphia. There was no water of any kind supplied to these wharves which are opposite the Christian Street freight station of the Pennsylvania Railroad Company.

Piers Nos. 46, 48, 53, 55, and 57, are owned by the Pennsylvania Railroad Company and leased by the International Mercantile Marine Company, the local agents in the Port of Philadelphia for the Southern Steamship Company, operating a line to South American ports, the American line whose vessels go to European ports, the Atlantic Transport Line plying between Philadelphia and Southampton, the Holland-American Line and the Red Star Line whose vessels go to the Mediterranean and other European ports. All of these steamships engage in passenger and freight transportation. The wharves are new and modern and extend out to the Port Warden Line. On Pier No. 53 there is a United States Immigration Station. About three hundred men are employed on these piers and city water is supplied for drinking purposes. Raw river water is piped in a separate line for fire purposes, fire pumps being maintained and tested every night up to the required pressure stipulated by the Fire Underwriters' Association, which is from forty to seventy pounds in excess of the pressure in the city mains at this point. It is deemed advisable and necessary to maintain pressure in these fire lines and consequently there is a six inch pipe connection to the city main. On each connection there is a stop valve and a check valve whose function is to prevent the raw river water from flowing back into the city mains. If the check valve leaked, the other valve being kept open, there was nothing to prevent the river water from passing into the city mains. During the summer of 1913 the city officials required the company to install an additional check valve, to keep the stop valve shut and sealed and also to construct a tank supported on standards. The tank was put into service but the connection between the two systems was not severed, the company contending that sufficient water could not be stored in the tank for fire protection purposes before the city fire apparatus could arrive. The State Department of Health maintained that additional pumping equipment should be installed and the connection between the city and the river pipe line systems severed, this arrangement obviating any possibility of contamination of the city water from the river and at the same time meeting the requirements of the company. Such an order was issued by the city officials and the company then proposed to do away entirely with the use of any river water provided the city would extend a sixteen inch main existing in Washington Avenue to the pier and connect it up with the fire line.

The only vessels docking at these wharves are those engaged in the business of the various companies mentioned. They obtain drinking water from the city supply on the piers and also purchase it from the water boats, depending upon convenience. Recently one of this company's vessels was delayed three hours in sailing owing to its inability to obtain a supply of water at the pier for drinking purposes, the vessel being obliged to wait until one of the water boats could replenish its supply from the city mains at one of the municipal piers, which could not be accomplished until eight o'clock in the morning. Such an occurrence materially increase the probability of the water boats replenishing their supply with the raw Delaware River water and point to the necessity that the city establish a twenty-four hour water service on at least one of its piers.

Piers Nos. 59, 60, and 61 are owned and operated by the Spreckels Sugar Refining Company and the only vessels docking at these piers are those engaged in the sugar trade, hailing principally from the West Indies and South American ports About one thousand men are continuously employed at the plant on the piers and city water in small quantities is supplied for drinking purposes. The industrial supply is pumped from the river and amounts to about forty-eight million gallons daily. There is no known cross connection between the drinking and the river water pipe systems. The vessels docking here are not supplied with water on the premises but are obliged to secure it otherwise.

Piers Nos. 62 and 63 are owned and operated by the Baltimore and Ohio Railroad Company as a freight transfer station. No vessels dock here and the freight cars are simply run on the floats and transferred to other points along the river. No Delaware River water is used and the only supply of water of any kind on the piers is at the power house where city water is used for the boilers and for drinking purposes by the ten men employed here.

Pier No. 64 is at the foot of Tasker Street and is operated by David France and Company, a concern engaged in transporting sand from the Delaware River and Chesapeake Bay ports. The barges engaged in this business are the only boats docking here and to each barge a crew of two men is assigned. It is reported that these men are accustomed to use raw Delaware River water. The tugs used for moving the barges are chartered for the trip. On the wharf twelve men are employed and city water only is furnished, this being used for drinking purposes and also in the boilers of the apparatus employed in unloading the sand and no boats are supplied here.

Piers Nos. 67, 68 and 69 are owned and operated by the William J. McCahan Sugar Refining Company which employs four hundred men at the plant and on the piers. City water is supplied for drinking purposes and river water for use in the boilers, condensing and fire purposes and the daily use of this latter supply is quite considerable. Only vessels engaged in the sugar business dock at these wharves, mostly coming from West Indian and South American ports. They are not supplied with any water at the piers but must procure it otherwise, mainly from water boats.

Piers Nos. 70 and 72 are owned and operated by the Baugh and Sons Company which manufactures glue, sal-soda, fertilizer, and tallow, and collects bones and waste pieces of meat from city markets. They also render dead animals. Four hundred and fifty men are employed and city water is supplied for drinking purposes and the lavatories while raw river water is pumped to the boilers and into the fire lines which extend throughout the plant and to the bulkhead line of the piers. Well water is used in the manufacturing process. Only tramp steamers and sailing vessels engaged in business with the company are permitted to use the wharves and no water is furnished to such craft.

Piers Nos. 73, 74, and 75 are at the foot of Mifflin Street being owned and operated by the Philadelphia Ship Repair Company, which concern repairs vessels. There is a dry dock located between each two piers. The company employs one hundred and fifty men and there is no city or river water used by a well on the premises supplies water for all purposes, this being used by the employees on the piers and the crews on the vessels and the tanks on the latter are filled from the same source.

Piers Nos. 80 and 81 are at the foot of Snyder Avenue, and are owned and operated by the Baltimore and Ohio Railroad Company. Pier No. 80 was destroyed by fire about two years ago and has not been rebuilt, but Pier No. 81 is operated for storing coal and supplying it to vessels, twenty men being employed. Vessels of all kinds up to 5,000 tons dock here and take on coal, but no water is furnished. City water is piped to the wharf for drinking purposes and river water is used for the fire service lines, being pumped to a tank and from thence delivered to locomotive tanks for steaming purposes. The employees on the pier have easy access to the river water if they choose to drink it.

Between Piers No. 79 and 81 there are numerous frame buildings of an inferior type occupied as dwellings to which drinking water is reported to be carried from the well at the plant of the Philadelphia Ship Repair Company, raw river water being used for washing purposes.

Piers Nos. 92, 93, and 94 are owned and operated by the Pennsylvania Salt Manufacturing Company, seven hundred men being employed at the plant and on the piers which are between Porter and Shunk Streets. City water is supplied at the works for drinking and lavatory purposes and large quantities of raw river water are used daily for manufacturing purposes and in the fire lines. It is reported that the management has found employees drinking the river water and warning signs have recently been posted throughout the works cautioning the men of the danger in using this supply. This concern manufactures sulphuric acid, alums, and various copper compounds and the only vessels docking here are the local and foreign ones having business with the company. Under the existing piping conditions, if water were taken on board the vessel it would be drawn from the fire hose but this practice is prohibited. It is reported that the river water used in the process of manufacture is first subjected to treatment of some sort. This company is the last concern to receive city water located south along the Delaware River.

Pier No. 103 is near the foot of Bigler Street, owned by the estate of Adam Louth and leased by the General Manufacturing Company which concern manufactures fertilizer, using for this purpose refuse from markets, bones, and dead animals. The locality is remote from habitations and about fifty men are employed. This is below the region of city water supply and water from a well located on the premises is used for drinking and manufacturing purposes. River water under pressure is supplied to a fire hydrant at this plant from an adjoining pier occupied by the American Agricultural Chemical Company. Barges under tow bring the raw material from various points along the Delaware and Schuylkill Rivers and are the only vessels using this wharf on which there is no water.

Piers Nos. 104 and 105 are owned and operated by the American Agricultural Chemical Company which conducts a fertilizer and acid plant employing two hundred men. The raw material is of the same character as that used at the General Manufacturing Company's plant on Pier No. 103 and is delivered on barges and by wagons. There is no city water here but there are two drilled wells on the premises reported to have been abandoned. Raw river water is distilled and

furnished for drinking purposes and the river water without distillation is used for manufacturing and fire purposes. On the piers there is no water. Local and foreign vessels having business with the company are the only ones using the wharves. A case of typhoid fever occurred at this plant early in the spring of 1913.

Piers Nos. 106 to 111 inclusive, known as the Greenwich Coal Piers, are owned and operated by the Pennsylvania Railroad Company, five hundred men being employed. Here coal is loaded on all kinds of vessels for transportation or as fuel. There are no dwellings in this vicinity and no city water, the only water supply at the piers coming from the Delaware River and is used in its raw state for all purposes except in the office where the employees drink only water from melted ice. The river water is pumped into the fire mains on the piers and into the water tanks whence the supply goes to the locomotives and to a system of boilers connected with the hoisting machinery. Taps are placed on the pipe lines and the men drink water drawn from the faucets. No water is permitted to be supplied from the piers and vessels or boats while coaling here are frequently furnished with water from the water boats. It is known that there were several cases of typhoid fever among the workmen on these piers.

The next two piers are not numbered. They are owned by the Pennsylvania Railroad Company and are at Greenwich Point a quarter of a mile below Pier No. 111, and between Hcyt Street and Pattison Avenue. The upper of the two wharves is known as Point House wharf and is an unloading point for lumber and railroad ties. The lumber is brought to the wharf by vessels engaged in coastwise trade. Car tracks extend out to the end of the pier. There is no drinking water on the pier nor do vessels take on any water from this wharf. Fire protection is afforded by a supply of river water furnished from the adjoining creosoting plant. The employees at the wharf comprise train and vessel crews.

The next pier and the last one down stream is similar to a bulkhead and on it is located the Pennsylvania Railroad Company's creosoting plant in which railroad ties are subjected to a creosoting treatment. There are forty men regularly employed on this pier. They reside in two dwellings provided for the purpose and located near by. The drinking water supply is from a drilled well. River water is pumped to a tank and flows thence to the steam boiler plant from which it flows by gravity to the office building, here being used for lavatory purposes and also to the two residences located near the bulkhead where it is also used in the lavatories. The well water must be pumped by hand and carried in buckets to the place of use. The river water as it comes from the taps is sometimes quite hot. Probably the employees find it more convenient to drink the river water which is at hand than the well water that must be carted or carried. No vessels are furnished with water at this wharf. One of the employees at this plant was a typhoid fever case.

NORTH WHARVES TO PORT RICHMOND.

At the foot of Market Street are located the Market Street ferry slips owned and operated by the Pennsylvania Railroad Company where one hundred men are employed and from which six ferry boats ply between Philadelphia and Camden. Prior to the fall of 1913 there was a dual water connection on the slips. The drinking water from the city mains was supplied throughout the station and for lavatory purposes. The raw river water was pumped into the fire lines and used for flushing the toilets. There was a four inch pipe connection between the two pipe systems provided with a gate valve kept open and a check valve set against the river supply. As a temporary measure, by order of the City Water Bureau, an additional check valve and a drip were placed on this cross connection and later a complete severence of the two systems was accomplished. In this station penny drinking cups are used and on the ferry boats no water is supplied to the public.

Pier No. 1 adjoins the Market Street Ferries. It is owned by the Girard Estate; Pier No. 2 is owned by the same estate; Pier No. 3 is owned by the estate of Thomas Clyde. The Clyde Steamship Company leases and operates these three wharves, maintaining steamship lines between Philadelphia and New York, Boston and New England ports and to Norfolk, Portsmouth, and Richmond, Va., freight only being handled at the Philadelphia piers. Approximately six hundred men are employed at the three piers and city water is provided for all purposes except at the offices where bottled water is furnished. No river water whatever is used nor is any water furnished to vessels at the wharves. It is understood that the steamships docking here at times secure water from the lower reaches of the Delaware River and use it raw for culinary and drinking purposes. No samples were collected on any of these vessels.

Pier No. 4, at the foot of Arch Street, with twenty employees, is owned by the city of Philadelphia and leased to six different companies as follows: the Chester Shipping Company, the Philadelphia-Rancocas-Mt. Holly Transportation Company, the Bridgeton Steamship Company, the Odessa Steamboat Company, the Smyrna Steamboat Company, and the Philadelphia and Salem Freight Company. On the wharves city water is used for drinking and fire purposes, and at the bulkhead lines there is a hand pump to raise raw river water into the wash

stands for the men, this being the only use to which the raw river water is applied on the wharf. Bottled water is used in the offices. There is no restriction regarding the taking on of city water from hydrants on the pier and it is reported that this is practised by the vessels having docking privileges, the practice being confined to only such vessels.

The Chester Shipping Company ordinarily operates three river steamers, for freight only, between Philadelphia and Chester, two of which, the Riverside and the Tinicum, were in service at the time of the investigation. The Riverside has a porcelain lined ice cooler fitted with a faucet located in the saloon. Ice is placed in contact with the water which ordinarily is the Philadelphia city supply carried on board from the pier in buckets. Occasionally the public supply at Chester is used, and in emergencies the raw Delaware River water is dipped up. There is a common drinking cup at the water cooler. On the upper deck aft, at the galley, there is placed a barrel with open top. This is kept filled with raw Delaware River water for culinary purposes. When the supply of water in the water cooler in the saloon becomes deficient water is dipped from this barrel for drinking purposes. On the lower main freight deck a small cask with an open top is kept filled with either Philadelphia or Chester city water. On the day of the Department's inspection an old tin can was found at this cask, used by the deck hands as a drinking utensil, the water being dipped from the cask.

On October 18th a sample of water was collected at the water cooler, this was the Philadelphia city supply and upon analysis showed a total bacterial count of three hundred with one B. Coli present in one cubic centimeter. A duplicate of this sample was secured on October 20th and in this the total count was 140 with no B. Coli present in one cubic centimeter. Also on October 20th a sample was taken from the barrel at the galley; this was raw Delaware River water and contained a total bacterial count of 2,400 with eight B. Coli present in one cubic centimeter. On the same day a sample collected from the small cask containing the Philadelphia city water showed a total bacterial count of 600 with no B. Coli present in one cubic centimeter.

The steamer Tinicum also has a water cooler in the saloon supplied with either Philadelphia or Chester City water; here ice is placed in contact with the water and a common drinking cup is provided. On October 18th a sample was collected from this container, this being the Chester City supply, and upon analysis showed a total bacterial count of 250 with no B. Coli present in one cubic centimeter.

The Philadelphia-Rancocas-Mt. Holly Transportation line, popularly known as the Van Sciver line, operates one steamer, the Admiral, for freight purposes only between Philadelphia and Mt. Holly, N. J., and intermediate points. On this steamer there is a covered barrel fitted with a faucet located on the rear upper deck. Philadelphia City water only is used, ice being put in the same barrel. On the day this boat was inspected, October 18th, a deck hand was observed dragging two cakes of ice over the dirty pier; he then immersed them in the raw river water to wash off the mud, after which they were placed in the barrel containing the drinking water. A sample of water was collected from this barrel after the ice had been placed therein, which upon analysis showed a total bacterial count of 1,400 and two B. Coli in one cubic centimeter. Two days later a duplicate sample was secured at which time no ice was in the barrel; this showed a total bacterial count of 1,500 and no B. Coli present in one cubic centimeter.

The Bridgeton Steamship Company operates one steamer, the Prospect, for freight and passengers between Philadelphia and Bridgeton, N. J. On this boat there is a small open cask, placed on the lower deck. A common drinking cup is provided and water must be dipped from the cask. The supply is raw Delaware River water taken from the stream near the city of Chester opposite Lincoln Park, N. J. The Captain claims that this water is free from sewage pollution being collected in the East Channel near the New Jersey coast. When inspected the cask was found to be in an abominable condition, it evidently not having been cleaned out for a long time, the bottom being slimy. A sample was collected from this cask in which the total bacterial count was 16,000 but was negative for B. Coli in one cubic centimeter.

The Odessa Steamboat Company operates one steamer, the Clio, for freight and passengers between Philadelphia and Odessa, Delaware. The water supply is kept in an open barrel on the upper deck aft and must be dipped out of the barrel. The supply is procured from a drilled well at Odessa. On October 21st a sample was obtained from this supply and found to contain a total bacterial count of 240 with no B. Coli present in one cubic centimeter.

The Smyrna Steamboat Company operates one steamer, the Frankie, plying for freight purposes only between Philadelphia and Smyrna, Delaware. On the lower deck aft the water barrel is horizontally placed. A hole has been sawed in the top of the barrel and covered with canvass. Here a drinking dipper is provided. The supply for this barrel is procured from a dug well near the dock at Smyrna. On October 21st a sample was collected and showed a total bacterial count of 600 with two B. Coli present in one cubic centimeter. When inspected the deck and the barrel were found to be in a filthy condition.

The Philadelphia and Salem Freight Company operates two steamers, the City of Salem and the Adelaide, for passengers and freight plying between Philadelphia and Salem, N. J., and Baltimore, Md. The City of Salem has a barrel on the upper forward deck placed horizontally with a hole sawed in the top and a tin

can attached to a string suspended in the water. On October 18th a sample was collected, this being the Salem water supply and found to contain a total bacterial count of 8,000 with one B. Coli present. Occasionally the Baltimore City water is used on this boat.

The steamer Adelaide has its drinking water supply in a covered barrel fitted with a faucet located aft on the lower deck. A common drinking cup is provided and water from Salem is the supply always used. Manufactured ice from Philadelphia is put into the water. A sample collected on October 20th showed serious contamination, the total bacterial count being 6,000 with 300 B. Coli present in one cubic centimeter.

In addition to the vesels described above there are three other steamers docking at Pier No. 4 during the summer season, from May to September. These are the Sylvan Glen and Sylvan Dell of the Washington Park Amusement Company plying between Philadelphia and Washington Park, N. J., and the steamer Columbia operated daily for excursion purposes by the Columbia Steamship Company between Philadelphia and Trenton. At the time of the Department's inspection the summer excursions were over.

The captain of the steamer Columbia while in command of a tug boat plying on the river, prior to his engagement with the steamer Columbia, was stricken with typhoid fever. The son of the proprietor of the Van Sciver line came down with typhoid fever during the season of 1913, being then employed as purser on the steamer Admiral. The Delaware River water was taken aboard at that time for drinking purposes.

Pier No. 5 is occupied by the United Fruit Company of Boston and the Lebanon Navigation Company, the former having fourteen steamers in commission, the latter being engaged in freight and passenger business between Philadelphia and Lebanon, Delaware, and intermediate points. The United Fruit Company's vessels, carrying both passengers and freight, are engaged in the fruit business and ply between Philadelphia and West Indian ports. On the wharf 150 men are employed and city water is used for drinking and fire purposes and raw river water is pumped to the boilers at the heating plant. The vessels of these two companies are furnished with city water from the hydrant on the pier and no other vessels dock at this wharf.

Pier No. 8 is owned by the Lehigh Valley Railroad Company and has three lessees, viz: the Sun Oil Company, the Commonwealth of Pennsylvania, and the Harbor Transfer Company. There are sixty men employed on the wharves and there is no water supply whatever. The Sun Oil Company uses the pier to dock its lighters which have no crew nor water supply. The Commonwealth of Pennsylvania has dockage privileges for the Harbormaster's patrol boat, which is supplied with water from the city main at the Race Street municipal wharf. The lighters of the Harbor Transfer Company dock at this wharf.

Pier No. 10, at the foot of Race Street, is owned by the City of Philadelphia which docks two city fire boats here and leases the remaining privileges to the Cuneo Importing Company and the Trenton Transportation Company. On the pier thirty men are employed and city water is used for all purposes, there being no use whatever of the river water. The upper deck of Pier No. 10 is used for recreation purposes.

The Cuneo Importing Company operates six steamers for freight only between Philadelphia and the West Indies. These vessels take on water for drinking purposes directly from the wharf hydrant. River water boats are also permitted to obtain the city water supply at this wharf and occasionally do so but the facilities for tying up are not very convenient.

The Trenton Transportation Company operates four freight barges between Philadelphia and Trenton. They secure water at Pier No. 10 and also at Trenton. The captain of one of the steam barges, the F. W. Brune, when interviewed by a Department officer stated that he had a prejudice against the Philadelphia City water and used the Trenton water only. The supply is kept in an open barrel on the lower deck. There is a common tin dipper. On October 21st a sample was collected and showed a total bacterial count of 450 with 40 B. Coli present in one cubic centimeter.

Pier No. 11, owned by the City of Philadelphia, and Pier No. 12, owned by the Pennsylvania Company for Insurance on Lives and Granting Annuities, are leased by the Baltimore and Ohio Railroad Company for general freight transportation purposes. This company docks its floating barges here. These barges carry no crews nor water supply. On the pier seventy-five men are employed and city water is supplied for all purposes, no other being available.

Practically the same conditions obtain on Piers Nos. 13, 14, and 15, owned and operated by the Pennsylvania Railroad Company as a general freight transfer station with 380 employees.

At the foot of Vine Street are the Vine Street ferry slips owned by the Pennsylvania Railroad Company from which three ferry boats are operated between Philadelphia and Wood Street, Camden. Thirty-four men are employed. City water is furnished on the slips for fire and domestic purposes and river water is used at the heating plant but there is no connection between the two systems. No public water supply is furnished on the ferry boats, the crews drinking Camden City water brought aboard in buckets.

Pier No. 19, known as the Vine Street wharf, owned by the City of Philadelphia, is new and the largest pier in the city. On it four hundred men are employed and here is located a United States Immigration Station. City water is used for all purposes. The wharf is leased to the Italian Lines Company operating ten steamships in connection with the Italian Companies (Navigazione Generale Italiana, La Veloce, Lloyd Italiano) sailing from Philadelphia to New York, Genoa, and Naples, and also to the Philadelphia and New Orleans Transportation Company, operating three freight steamers between Philadelphia, Charleston, and New Orleans. The vessels of this latter company are not permitted to take water from any other point than Philadelphia where they obtain it from the hydrant on the pier. The Italian Lines get water at this pier and also at foreign ports. Permission is granted the river boats to draw a supply from the hydrants at this pier.

Pier No. 24, at the foot of Callowhill Street, is owned by the Philadelphia and Reading Railway Company and leased to the Allan Steamship Company which operates three steamers for freight and passenger traffic between Philadelphia and St. Johns, Halifax, Glasgow, and Liverpool. Two hundred men are employed on the wharf and city water only is supplied here and used for all purposes. At times the steamships take water from the hydrants on this pier, again buying water from water boats and securing still another supply at other ports.

Pier No. 25, owned by the Philadelphia and Reading Railway Company, is leased to the Philadelphia Transatlantic Line and to the Bull Line, the former operating four steamers for freight only between Philadelphia and London and the latter operating four steamers for freight only between Philadelphia and Leith, Scotland. At the wharf two hundred men are employed and city water is used for all purposes. This is solely an import pier, the export pier being at Port Richmond where the vessels take on city water.

The next Pier, No. 27, also owned by the Philadelphia and Reading Railway Company, is leased to the Holland-America Line operating four steamers for freight only between Rotterdam and Philadelphia, and to the Scandinavian Line with four steamers carrying freight only between Philadelphia and Copenhagen. Here two hundred and fifty men are employed and city water is used for all purposes. This is solely an import pier, the vessels taking on city water at Port Richmond.

The Philadelphia and Reading Railway Company owns also Nos. 29 and 30, which are used exclusively for storage and are known as the Apple Yard. No boats dock here nor is any water supplied except city water in the offices. Twenty men are employed.

Pier No. 31 near the foot of Green Street, owned by George H. Kydd, is leased exclusively for the storage of salt. No boats dock here. There is no water on the wharf, twenty men are employed and drinking water for the office must be brought in by buckets from city faucets.

The City of Philadelphia owns Pier No. 32 which is leased to the George W. Kugler and Sons Company, lumber dealers. Ten men are employed and their drinking water is obtained in buckets from faucets in the neighborhood no water being piped on the pier. Barges under tow bring in the lumber and dock at this pier.

Piers Nos. 33 and 34 are owned by the Philadelphia Rapid Transit Company, and to this tramp steamers, schooners, and tow barges bring ties, stone, and sand, no other vesels docking here. There is no water on the pier and drinking water supplies for the thirty men employed here must be obtained elsewhere.

Pier No. 35, at the foot of Fairmount Avenue, is owned by the City of Philadelphia and leased to the Cornworth Bell Company, general lumber dealers, who employ twenty men. There is no water on the pier and drinking water is brought in in buckets from city faucets of the neighborhood. Lumber barges dock here but do not take on water at this place, securing it otherwise.

Pier No. 35½ belongs to the estate of Thomas H. Powers and is leased to the American Ice Company. Sailing vessels bring in ice from the Hudson River and the State of Maine. Fifty men are employed at the wharf and city water is supplied for drinking, and raw river water for fire purposes, this water being placed in open barrels located at suitable points about the pier. A bucket may be found at each barrel. The vessels get their drinking water from water boats.

Pier No. 36 is owned by the Thomas H. Powers Estate and is leased to Charles F. Felin and Company, engaged in a general lumber business. Ten men are employed and the same conditions as to water supply obtain here as at Pier No. 35½. Various steamers, sailing vessels, and barges bring in the lumber.

Piers Nos. 37 and 38 are near the foot of Poplar Street. They are owned by Edwin W. Henson and Clayton W. Nichols who conduct a general lumber business. There is no water on Pier No. 37, but on Pier No. 38 city water is supplied for all uses and bottled water is used in the office. Forty men are employed. Various kinds of vessels bring in lumber but are obliged to get their water else-

where as there are no facilities at the wharf for taking on water. It would be inconvenient to carry the water aboard in buckets because of the long walk; water boats probably get the business.

Pier No. 39 is owned by Clayton W. Nichols, who operates a box factory on it, ten men being employed. The wharf is supplied with city water for drinking and there is also a fire hydrant at the bulkhead liue. On the pier barrels filled with raw river water are placed and fire buckets provided. The vessels bringing the lumber in cannot get water here and it is reported to be the custom of the crew of the barges to take raw Delaware River water aboard near Wilmington.

Pier No. 40 is owned by the Terminal Land Company and leased by the Baltimore and Ohio Railroad Company. It is used as a freight transfer station, only float barges docking here. Twelve men are employed and city water is supplied for all purposes on the pier, but no water is supplied to tugs. The barges carry no crew.

Pier No. 41 is owned by the Electric Traction Company and leased by the Philadelphia Rapid Transit Company. Only coal barges dock here. Seven men are employed and there is no water on the pier. Bottled water is supplied at the office.

Pier No. 42 is owned by W. S. Taylor and C. M. Betz, and leased by Charles F. Felin and Company for general lumber purposes. Sixty men are employed and city water is supplied for drinking and there is also a city fire hydrant at the bulkhead line. About the wharf are many open barrels filled with raw river water and provided each with a fire bucket. Bottled water is furnished at the office. The various vessels bringing in lumber obtain their water from water boats.

Pier No. 43 is owned by the Philadelphia and Reading Railway Company and is known as the Laurel Street Freight Station. Two men are employed here in the capacity of watchmen. City water is supplied for all purposes. All kinds of vessels dock at the wharf, the smaller vessels tying up close enough to the bulkhead to take on city water. The larger vessels rely on the water boats.

Pier No. 44 is owned by Edward B. Malone and is leased by Watson Malone and Sons for a general lumber, sand, and stone business. Fourteen men are employed and city water is supplied for all purposes but none is furnished to vessels engaged in the trade and docking here. Presumably their supply of drinking water is obtained from the water boats.

Pier No. 45 is owned by the J. W. Paxson Company and is used in the sand and gravel business. They operate twenty sailing vessels and steam barges and also engage in furnishing builders supplies. Fifty men are employed; city water is used for drinking and raw river water is used for fire and boiler purposes. There is said to be no connection between the two pipe systems. The vessels do not take on drinking water here but very generally the captains are reported as using raw Delaware River water taken aboard near Lardner's Point or Wilmington, Delaware.

Pier No. 46 is owned by the Pennsylvania Sugar Company. Here a refinery is located and between six and seven hundred men are employed. River water is used for general manufacturing purposes and is first filtered, city water being supplied for drinking. Steamers from European and West Indian ports bring in raw material. City water is also used in the fire mains. The boats are permitted to take on water from these mains on the wharf.

Pier No. 47 is owned by George W. Gormley, who gathers horse manure about the city, stacks it up on the wharf, and ships it away in deck scows; he also handles sand and gravel. City water is supplied; there is no fire protection and twenty-five men are employed. No water is furnished to the tugs.

Piers Nos. 48, 49, and 50 are owned by the Pennsylvania Railroad Company and are operated for general freight transfer. All kinds of river and ocean steamships and vessels dock here, one hundred and forty men are employed, and city water is supplied for all purposes, except fire. No use is made of raw river water. The vessels docking here must get water elsewhere.

At the foot of Shackamaxon Street is the ferry slip operated by the Pennsylvania Railroad Company from which one ferry boat plies between Philadelphia and Cramer Hill, Camden, seven men being employed. There is city water for drinking and fire service at the station and no use is made of river water. No public water is supplied on the boat, the crew using Camden city water brought aboard in a bucket.

Pier No. 51 is owned and occupied by S. V. Vrooman and Company, Ltd. Here is a saw and planing mill to which lumber is brought by various kinds of vessels which obtain their water from water boats. Thirty-five men are employed and city water is supplied for drinking and raw river water is furnished for fire and boiler purposes. There was formerly a dual connection to the city mains, which was severed the early part of October.

Pier No. 52 is owned by J. W. Janney, engaged in a general lumber business, with seven employees. City water is used for drinking and washing purposes and raw river water for no purposes whatever. The river and coastwise vessels bring in the lumber and they can obtain drinking water from the wharf but usually buy from water boats.

Pier No. 53 is owned by Frank Merrihew and leased by Frank Merrihew and Sons, engaged in a general coal and kindling wood business. Only such coal barges and vessels as are engaged in business for this firm dock at the wharf where twenty men are employed. City water is supplied for drinking. Raw river water is used for steaming purposes and on the wharf there are numerous barrels filled with river water and provided with fire buckets. The coal barges come mostly by canal from the Lehigh River District. They take on raw Delaware River water wherever they need it. There is no supply available for them at the pier, except it be carried in buckets.

Pier No. 54, owned by the American Sheet and Tin Plate Company, is leased by the General Chemical Company of Camden, and is used as a storage wharf for the works which are located in Camden. Only their own vessels used the pier where fifteen men are employed. City water is furnished for drinking and at the wash bowls. Raw river water for fire protection is supplied to barrels provided with fire buckets, and no water is furnished to the boats.

Pier No. 55 is owned by the Knickerbocker Ice Company and leased by the American Ice Company. Here is an ice house for the convenience of the wagons retailing the commodity, no ice being brought in by vessel. A part of the pier is rented to any one who may wish to store lumber, and lumber barges are the only vesels that dock here. There are thirty men employed and city water is supplied for drinking. Raw river water is used in barrels about the wharf from which it is dipped in buckets in case of fire. The barges take water from the city hydrant at the wharf.

Pier No. 56 is owned by Charles Lennig and is leased by Charles Lennig and Company, On it is a chemical warehouse and ten men are employed. There is no water on the wharf except in barrels in connection with the fire buckets. Coastwise and river freight boats and barges dock here; most of the barges obtain raw Delaware River water off Wilmington.

Pier No. 57 is at the foot of Columbia Avenue, is owned by the city of Philadelphia and used as a fire station and recreation pier. There are fifteen employees. There is no water on the pier but opposite the pier is Penn Treaty Park of which the pier is virtually a part. It is earth filled and laid out in walks, grass plots and shade trees and has a public pavillion. The public obtains drinking water from the city faucet in the park. Only the fire boat, W. S. Stokeley, docks here, but the water boats are permitted to obtain city water at the dock near the bulkhead line and this is a common place of supply for water boats.

Piers Nos. 59, 60, and 61 are said to have been recently acquired by the Philadelphia Electric Company, but at the time of the investigation were not occupied. Formerly they belonged to the Neafie and Levy Ship and Engine Building Company.

Pier No. 61½ is owned by the Porter-Gildersleeve Company employing ten men, and is used as a dump for street sweepings, ashes, dirt, and any other material suitable for filling. Deck lighters dock here, receive their load and are towed to the place of deposit. There is no water on the pier or premises.

Piers Nos. 62, 62½, 63, 63½, and 65 are owned by the William Cramp and Sons Ship and Engine Building Company and leased by the Kensington Shipyard Company. A thousand men are employed and general repair work to vessels is performed here. There are several shipways and a dry dock. There is no water on Piers Nos. 62½, 63, and 63½, but on Piers Nos. 62 and 65 drinking water is furnished from the city mains and is also used at the wash basins. For all other purposes raw river water is supplied. During the summer of 1913 the raw river water lines were connected to the city water mains, by a two inch pipe provided with a check valve. In July a second check was placed on this line and on September 11th the city water connection to the raw water lines was absolutely severed. The vessels docking here obtain their drinking water from the city pipe lines on the two piers mentioned.

Pier No. 66 is owned by Hughes and Patterson, Incorporated. They operate a rolling mill which has been out of commission all the year 1913, but across Beach Street, or Delaware Avenue, they have another plant which is in operation. Raw river water is used for general purposes and city water is supplied for drinking.

Pier No. 67 is owned by the De Frain Sand Company, handling general builders' supplies. Eighty men are employed and city water is furnished for drinking on the wharf. The cranes and plant are operated by electricity. There is a pump through which raw river water is secured for sprinkling and fire service, the latter service being secured through a long line of hose. Bottled water is furnished to the office. Vessels can take on city water at this pier but the barges get most of their drinking water from the Upper Delaware River, using it raw.

Piers Nos. 68 and 69 are owned by William M. Lloyd, general lumber merchant, thirty men being employed. City water is used for drinking and fire purposes and in addition barrels for river water and fire buckets are provided at various points on the wharves. All kinds of lumber vessels dock here, the water boats providing these vessels with water.

Pier No. 70 is at the foot of Susquehanna Avenue and is owned by the City of Philadelphia, the end being devoted to public recreation purposes. The City Bureau of Water has a storage yard here for supplies and the Purveyor's office is located at the street end. At this point Morgan and Hansbury operate a one boat ferry line between Philadelphia and Cramer Hill, Camden. Twelve men are employed on the wharf, and city water is supplied for drinking and fire protection. It is reported that a little river water is used for steam heat. The crew of the ferry boat drink the city water, brought aboard in a bucket.

Pier No. 71 is owned by Hughes and Patterson and is leased by Seaman and Menaugh, and William McAllister, both lumber merchants. City water is supplied for drinking and raw river water for fire protection, by means of open barrels with fire buckets. Ten men are employed.

Pier No. 72 is also owned by Hughes and Patterson and is leased to the Haines-port Mining and Transportation Company. Canal and river boats mostly dock here, and heavy freight is handled, in addition to sand and gravel. Thirty men are employed. There is no water on the pier. The boats use raw water, secured principally above or below Philadelphia.

Piers Nos. 75 and 76 are owned by the Lehigh Coal and Navigation Company and are leased by the B. & S. Transportation Company. Coal is brought here in barges and stored, heavy cranes being used in the handling. Four tugs owned by the company dock here. City water is supplied on the wharf for all purposes, but the tug boat captains prefer raw river water secured either above or below Philadelphia although they can, if they choose, get city water at this pier.

The William Cramp and Sons Shop and Engine Building Company own and operate Piers Nos. 77 to 83 inclusive, and 85 and 86 and Pier No. 20, this latter being the last pier down stream in the series beginning at Port Richmond. Five thousand men are engaged in the construction of large ocean steamships, warships and vessels of all kinds. This is the old I. P. Morris plant. Until the fall of 1913 the city water mains were connected with the fire lines of the company by means of a six inch pipe, the connection being metered, and provided with a stop valve. The company used raw river water in connection with special fire pressure pumps for fire service, which pumps were tested frequently and the pressure raised. During the summer of 1913 the city ordered a check valve placed on the connection and later the entire abandonment of the connection. There is a tank on top of the office building to which city water is pumped through an independent line of pipe and this water is distributed for drinking and at the wash stands.

Raw river water is supplied to the boilers for steaming. Two years or more ago a typhoid epidemic occurred among the workmen who used the raw river water delivered through the pipe lines, so that at present warning signs, printed in different languages, are posted throughout the plant. The company fills the drinking tanks on the new vessels, with city water and also furnishes raw river water to these vessels when steam is gotten up.

NORTH WHARVES—PORT RICHMOND TO CITY LINE.

The remaining series of wharves along the Delaware are those extending north from Port Richmond to Erie Avenue from which point the piers have not been numbered by the city. The pier in this series farthest down stream is at the foot of Cumberland Street in Cramp's shipyard and is known as Pier No. 20. Beyond this in order northerly and up-stream are piers Nos. 18, 16, 14 to 1 inclusive and Piers A, B, C, D, G, H, and J, all of which are owned by the Philadelphia and Reading Railway Company and constitute what is known as the Port Richmond Terminal of this company. Seventeen hundred men are employed at these piers, Pier J being at the foot of Allegheny Avenue and three miles above Market Street. These terminal facilities cover a continuous territory for three quarters of a mile along the river bank. Piers No. 1 to 18 inclusive, with the exception of Nos. 12, 13, and 14, are coal wharves, No. 12 being a grain elevator, and Nos. 13 and 14 iron ore wharves. Piers A to D are export piers and leased by various ocean steamship lines. Piers G and H are used for general heavy freight business and any vessels may dock here having business with the Philadelphia and Reading Railway Company. On Pier J cars are loaded on flat boats for transfer in the harbor.

At all of the piers city water is supplied for drinking purposes and for fire protection, and at Piers Nos. 18, 14, 12, and 11, which are long and extend out to the Port Warden Line, being used respectively for coal loading, iron ore storage, grain handling, and coal loading, city water is furnished free to the vessels while they are in dock and adequate facilities are here provided for this purpose. The other numbered piers are of short length and it is not convenient to secure water there. The piers lettered A to D inclusive also extend out to the Fort Warden Line and supply city water to vessels docking there. Piers G and H which are equally long do not have the proper conveniences thus to supply vessels.

At Pier No. 12, on which is the grain elevator, raw river water is used for the fire lines and special fire pumps are kept in constant readiness for service. For priming purposes there was a cross connection between the city mains and the fire system which until early in the summer of 1913 had a valve but no check. At this time two check valves were put in and the gate valve shut and put under seal. Later this connection, which was three inches in diameter, was completely severed. Formerly there was a three inch pipe line from the city mains connected to the discharge pipe of the raw river pump which fed the boiler. It is claimed that the valve on this line was always kept closed. As a temporary measure of precaution a check was placed on the line and the valve kept under seal but later a complete severance was made.

Pier No. 14, which is an iron ore dock, has a power plant for hoisting apparatus and raw river water is used for boiler purposes and fire lines. There was formerly a dual pipe connection here between the city mains and raw water pipes but this has been severed.

At the foot of Allegheny Avenue is a recreation pier owned by the city and also used as a landing place for small river passenger boats. This pier has no water supply.

Near the foot of Westmoreland Street, there are two piers owned by the Ontario Land Company and leased to the Pearson and Ludascher Lumber Company. Fifty men are employed and city water is supplied for drinking. River water is used in the boiler house in connection with operating the saw mill and for fire service, but the two lines are separate. Bottled water is supplied to the office. The lumber boats cannot get water here.

At the foot of Tioga Street are two piers owned by the city and leased to the United Gas Improvement Company in connection with the Twenty-fifth Ward Gas Works. Here three hundred men are employed and city water is supplied for drinking and at wash basins. Raw river water is furnished for fire protection and manufacturing purposes. The employees can easily procure raw water for drinking and no warning signs have been posted but the manager has agreed to do this. Coal barges dock at the piers but are not supplied with drinking water.

There is a pier at the foot of Venango Street owned by M. L. Shoemaker and Company, Limited, which company employs one hundred and twenty-five men and manufactures fertilizers. In the plant city water is supplied for drinking and raw river water is used for fire protection and boilers. There is an artesian well, water from which is used in the manufacturing processes. Fleshings, bones, and dead animals are brought here in wagons and in scows. There is no water on the pier and the lighters have to obtain a water supply elsewhere. One hundred and twenty-five men are employed.

SCHUYLKILL RIVER DOCKAGE FACILITIES.

The bulkheads extend along the Schuylkill River from its mouth near League Island up-stream to Fairmount dam. In the description of these docks following they have been taken in order of their location from the mouth of the river up-stream. The first to be described are those on the east bank following which will be a description of the bulkheads along the west bank.

The Girard Point Storage Company, engaged in the handling of grain, has fourteen hundred feet of bulkhead frontage along the east bank of the Schuylkill River from South Twenty-sixth Street northerly. This is near League Island. The Pennsylvania Railroad tracks extend into the buildings and the elevator and there are slips where the vesels may dock while loading. Eighty men are employed. There is no city water on the premises but an artesian well affords drinking water and raw river water is used for fire and industrial purposes. The company does not own a vessel but engages steamships to transport the grain to its destination, these vessels obtaining water from waterboats along the Delaware River. There are no facilities for supplying water on the property.

The second bulkhead, opposite South Thirty-fifth Street, is owned by the Girard Estate and leased by Peoples Brothers who operate a street refuse dump. This firm has a city contract for street sweeping and for collecting ashes. Scows are filled at convenient points and towed to this bulkhead where the material is raised to cars and hauled to be dumped on the neighboring flats which are in process of reclamation. Six men are employed. There is no water supplied for drinking, and river water is used in the boilers. The men on the scows get water occasionally from a well at Penrose Ferry Bridge Hotel. A few hundred yards up-stream from this bulkhead is the Penrose Ferry Bridge.

The next bulkhead is at Passyunk Avenue where the Atlantic Refining Company has a river frontage of sixteen hundred feet, extending south from Passyunk Avenue. Two thousand men are employed and city water is used for drinking and river water for fire and industrial purposes, first being subjected to filtration.

The company does not own the vessels engaged in exporting its products but owns and operates three tugs and five tow barges, plying in the local waters only. The tug boats are provided with water tanks and engage in supplying water to the vessels chartered by the company, obtaining their supply from the city on company property. It was reported that hose employed for supplying drinking water is used exclusively for this purpose.

The fourth bulkhead up stream, just north of Passyunk Avenue Bridge, is owned by the City of Philadelphia and leased by the United Gas Improvement Company. Here are the Point Breeze Gas Works and four hundred men are employed. City water is used for drinking and raw river water for fire and industrial purposes. Vessels docking at this bulkhead are principally coal and sand barges, towed in.

The fifth bulkhead is just above the United Gas Improvement Company and is used by the Atlantic Refining Company.

The sixth bulkhead is at the foot of Morris Street, just below the Baltimore and Ohio Railroad bridge and is owned by the American Incinerating Company, the corporation that had the contract to collect and destroy the garbage of the city but failed recently, the plant being taken over by the city. The wastes were brought to the plant both in wagons and in scows. At the time of the investigation by the Department the plant was shut down and no definite information could be obtained as to the use of water.

The seventh bulkhead, just north of the Baltimore and Ohio Railroad, is owned and occupied by the Philadelphia Rubber Company with one hundred and twenty-five employees. City water is used for drinking and raw river water, filtered, is used for fire and industrial purposes. Bottled water is furnished at the office. No vessels of any description dock here. There was formerly a one inch pipe connected to the centrifugal pumps that raise the river water, used for priming purposes, but it has been disconnected.

The eighth bulkhead is opposite the foot of Wharton Street, the owners being Michael Ehret and Michael Ehret, Jr., and Company, and the properties are leased by the Barrett Manufacturing Company, manufacturers of roofing material. Two hundred men are employed and city water is supplied for drinking. Raw river water is used for fire and industrial purposes. Schooners loaded with asphalt from South America dock here and also sand barges and coal barges but no water whatsoever is supplied to these craft.

The ninth bulkhead, just above Grays Ferry Bridge, is owned by the D. B. Martin Company. The plant is known as the Grays Ferry Abattoir and employs fifty men. City water is used generally for all purposes but some raw river water is used in washing down the floors. Bottled water is furnished at the office. The bulkhead is practically out of commission. Coal and sand barges occasionally dock here but no water is supplied to them.

The tenth bulkhead, at the foot of South 36th Street, is owned and occupied by Harrison Brothers and Company, Incorporated, manufacturers of chemicals and paints. Here three hundred men are employed. City water is used for drinking, being refiltered at the plant. It is also supplied to some fire plugs but the principal fire protection is obtained by a separate fire service system supplied with raw river water. For boiler purposes filtered river water is used. Four tramp steamers dock here annually and bring in raw material. Coal and sand barges convey material here for the use of the company. No water whatsoever is supplied to these craft at the bulkhead.

The eleventh bulkhead is at the foot of Peltz Street. It is owned by the Frederick R. Gerry Company, Builders and Contractors, who employ three hundred men in a saw mill and a plant for the manufacture of bank, store, and office fixtures. City water is supplied for drinking and raw river water is used for fire and industrial purposes. There was formerly a dual water connection here but it has been severed. Lumber sailing vessels dock at this point but they are never furnished with any water.

The twelfth bulkhead, at the Christian Street bridge of the Pennsylvania Railroad, is owned by the United States Government and maintained for the arsenal where eight hundred men are employed in the manufacture of clothing and camp equipment. No river water is used for any purpose and the city water, refiltered, is supplied for drinking and without refiltering for all other purposes. At the present time no vessels dock here.

The thirteenth bulkhead is at the foot of Christian Street. It is owned by the Philadelphia Electric Company and is this company's station "A" power plant in which fifty men are employed. City water, refiltered, is supplied for drinking and raw river water is used for fire and industrial purposes. There was formerly a four inch city water pipe directly connected to a four inch raw river water pump suction pipe on which connection the city required two valves, with a drip between, to be placed, this being accomplished during the summer of 1913. Finally, the city water was delivered to a tank in the yard and connection with raw water line severed. Coal barges dock at the bulkhead but no water is supplied to vessels here.

The fourteenth bulkhead is also at the foot of Christian Street and is owned by the DeFrain Sand Company which employs forty men. Sand, gravel, and coal are brought in in barges and builder's supplies are also handled. City water is supplied for all purposes, none being furnished to the vessels.

The fifteenth bulkhead is owned by the Philadelphia Rapid Transit Company and eighty men are employed in its repair shop here, city water being used for all purposes. Vessels do not now use the bulkhead.

The sixteenth bulkhead, adjoining the fifteenth, is owned by the Philadelphia Rapid Transit Company and leased by John C. Hancock to be used for coal yards. Here twenty-five men are employed and city water only is used, except that bottled water is supplied at the office. Coal is delivered by canal barges but no water is supplied to any vessels except these coal barges.

The seventeenth bulkhead is owned by H. C. Fox and Sons, Incorporated, who operate a glass factory here, employing three hundred and seventy-five men. City water is used for drinking and fire purposes, and river water is supplied for the boilers. Coal is delivered in river barges but no water is supplied them at the bulkhead.

At the eighteenth bulkhead is a coal yard, at the foot of Bainbridge Street and is owned by the George B. Newton Coal Company. Here twenty-one men are employed, city water being used for drinking and raw river water for fire and industrial purposes. River coal barges bring in the coal but no water is supplied these boats.

The nineteenth bulkhead lies between South and Lombard Streets, both above and below the South Street bridge. It is owned by the Standard Ice Manufacturing Company and leased by Charles F. Felin and Company, lumber dealers, which also has piers on the Delaware River. Two men are employed all the time at the bulkhead. Schooners dock here but there is no supply of water whatsoever on the property, it being merely a storage yard.

The twentieth bulkhead is at the foot of Lombard Street. It was formerly a coal yard, but was not in use at the time of the Department's inspection.

The twenty-first bulkhead, at the foot of Pine Street, is owned by Robert Henderson and Company and leased by the George B. Newton Coal Company for coal yard purposes. Eighteen men are employed and city water is used for drinking and fire protection, raw river water being supplied to the boilers. Both canal boats and river barges deliver the coal here but are not supplied with water by the company.

The twenty-second bulkhead adjoins, is owned by S. E. and J. J. Donaghy and used as a coal yard. Here fifteen men are employed and the conditions as to water supply and uses thereof are the same as at the last mentioned bulkhead. The coal is brought in barges from Trenton

The twenty-third bulkhead is owned by the American Ice and Coal Company and is at the foot of Spruce Street. City water is used for all purposes and twenty-three men are employed. River coal barges bring in the material but the company does not supply water to them.

The twenty-fourth bulkhead, between Locust and Walnut Streets, is owned by Collins and Lippincott and leased by P. Elmer Weitzel Brother and Sons. It is used to store lumber and there is no water supply on the bulkhead. The schooners and barges which dock here must obtain their water elsewhere. Four men are regularly employed.

The twenty-fifth bulkhead is just above the Walnut Street bridge extending upstream to the Chestnut Street bridge. It is owned by the Baltimore and Ohio Railroad Company but no use is made of it except as a dock for the city police boat, "John E. Reyburn," and for a pleasure yacht owned by Sergeant Peoples. City water is supplied on the property for drinking purposes and raw river water for fire service, but this latter service is performed by the police boat which is equipped with fire pumps and patrols the Schuylkill and Delaware Rivers. The fire boat obtains its drinking water from the station maintained by the city on the property.

The twenty-sixth bulkhead is at the foot of Cherry Street and is owned and occupied by Robert Patterson and Sons as a coal, sand, and gravel wharf. This firm employs thirty-five men. City water is supplied for all purposes. The material is brought in on river barges but no water is supplied to them at the wharf.

The twenty-seventh bulkhead lies between Vine and Wood Streets and is owned by the John Lang Paper Company who employ one hundred and thirty men. Waste paper is collected in the city and here sorted and baled. City water is supplied for drinking and raw river water for fire service, bottled water being furnished at this office. Coal is brought to this wharf on river barges, which get their drinking water elsewhere.

The twenty-eighth bulkhead is at the foot of Powelton Avenue and is owned by the Ford and Kendig Company, steam fitters and dealers in plumbers supplies. They employ sixty-four men. City water is used for all purposes excepted that bottled water is furnished at the office. Coal is brought to the wharf in river barges but no drinking water is taken on here.

The twenty-ninth bulkhead adjoins and is owned by the Knickerbocker Lime Company employing sixty men. This company supplies sand, gravel, coal, and lime to contractors. City water is used generally for all purposes, bottled water being furnished to the office. River barges bring in the raw material, excepting lime. No drinking water is furnished to them.

The thirtieth bulkhead, adjoining the twenty-ninth, is owned by the Baltimore and Ohio Railroad Company and leased by the Penn Reduction Company. It is reached from Callowhill Street. At this wharf garbage is dumped into scows and conveyed down the river to a reduction plant operated by the same company, five garbage scows being thus employed. Three men work at this wharf but no water is furnished. City water is carried from the adjacent bulkhead of the Knickerbocker Company. Water is not provided on the scows.

The thirty-first bulkhead is next up-stream and adjoins. It is leased by Peoples Brothers for handling coal, sand, and gravel. They employ eighteen men. City water is furnished for drinking and raw river water for fire and industrial purposes. River barges bring the raw material in but these vessels must secure their drinking water elsewhere.

The thirty-second bulkhead is owned by C. D. Norton and is leased by the Conroy Coal Company which employ twelve men. City water is supplied for drinking and raw river water for fire and industrial uses. The coal is brought in canal boats from the Upper Schuylkill Region and no water is supplied to them at the wharf.

The thirty-third bulkhead is reached from Callowhill Street and is owned by the H. D. Stratton Ice Company. Here ice is manufactured, fifteen men being employed. City water is used for drinking and industrial purposes and raw river water for fire service. Coal is brought in by boats from the Delaware piers but no drinking water is furnished to them.

The thirty-fourth bulkhead is owned by the Philadelphia Electric Company and is Station "G" power plant. Twenty men are employed. City water is supplied for drinking and raw river water for fire and industrial purposes. A dual pipe connection formerly existing has been severed. Coal is brought in barges from the Delaware piers. No drinking water is supplied to them.

The thirty-fifth bulkhead is at the intersection of Callowhill and Spring Garden Streets, just below the Spring Garden Street bridge. It is owned by Thomas Lockhart and Company and maintained as a dirt wharf, this concern engaging in carting away surplus earth from various excavation jobs in the city. One man is employed all the time on the wharf and city water is supplied for drinking. Two scows owned by the company dock here.

BULKHEADS ALONG THE WEST BANK OF THE SCHUYLKILL RIVER.

Along the west bank the first bulkhead above the mouth of the river is immediately south from Passyunk Avenue bridge. It is owned by the Atlantic Refining Company and affords a location for crude oil tanks. Water is supplied from the works of this company on the opposite or east bank of the river and already described.

The next bulkhead upstream is off Passyunk Avenue on land of Harry D. Beaston. Pleasure boats and some sand boats tie up here but there is no water at the wharf.

The third bulkhead is at the foot of South 58th Street and is owned by the Gulf Refining Company employing fifty men. City water is supplied for drinking and raw river water for fire purposes. Water also is piped from a spring to a pump well, and from here lifted to the boilers. For shipping the product three steamships and one tow barge, owned by the company, are employed and it is reported that no water is supplied at the wharf to the vessels.

The fourth bulkhead lies between the Baltimore and Ohio Railroad bridge and South 49th Street. It is owned by the Penn Reduction Company and here there is a garbage reduction plant where one hundred and seventy men are employed in disposing of the garbage of the city. City water is supplied for drinking and raw river water is used for fire and industrial purposes. The garbage is brought to this plant in barges which are loaded at the Callowhill Street bulkhead. The men on these scows get city water at the plant.

The fifth bulkhead is just above the South Street bridge. Between the South Street and Walnut Street bridges there is a continuous bulkhead. The one now being described is farthest down stream. It is owned by the city of Philadelphia and leased to John Maxwell and Sons as a stone and granite wharf and workyard. This firm employes thirty-five men and city water is used for all purposes. Barges carrying sand and gravel and schooners loaded with stone and lumber dock here. No drinking water is supplied to them.

The sixth bulkhead is leased from the city by Franklin Smith, lumber merchant, who employes eight men. City water is used for drinking and fire purposes. Schooners and barges dock here but do not obtain water.

The seventh bulkhead is leased from the Pennsylvania Railroad Company by the Haney-White Company, lumber merchants. Ten men are employed and the same conditions as to water supply obtain here as at the sixth bulkhead.

The eighth bulkhead is leased from the Realty Security Company by the Pintsch Compressing Company, manufacturers of Pintsch gas. Seven men are employed and city water is used for all purposes. At the present time no vessels dock at the wharf.

The ninth bulkhead is leased by John Warner and Company, engaged in the sand, gravel, and stone business. Six men are employed and city water is supplied for all purposes. Barges bringing in the raw material dock here but are not furnished with drinking water at the wharf.

The tenth bulkhead is just below the Walnut Street bridge. It is owned by the George B. Newton Coal Company, coal dealers and twenty-four men are employed. City water is furnished for all purposes. Coal is delivered here by canal boats from the Upper Schuylkill and also by river barges from the Delaware piers and from Trenton. It is credibly reported that the canal boat crews follow the practice of obtaining their water supply from favorable spots on the canal and that the river barge crews very generally use raw Delaware River water, procured preferably at Florence just below Roebling, N. J. Here there is a clear spot in the Delaware, said to be due to springs. Barges not traveling so far take their water from the river at convenient points. Some of them use the city water supplied free at the Port Richmond Terminals. It is not often convenient to get it from water boats.

The eleventh bulkhead, owned by the Vermont Marble Company, is just above the Walnut Street bridge. Twenty men are employed and city water only is supplied and used for all purposes. Sand and stone barges dock here, hailing from New Jersey ports and are said to use the raw river water.

The twelfth bulkhead is owned by Wetherill Brothers and leased by the Stokes Brothers Lumber Company. This firm employes eight men. City water is used for drinking and fire purposes. Schooners and barges dock here but no water is furnished them at the wharf.

The thirteenth bulkhead adjoins the twelfth and is owned by P. H. Fairlamb. Employment is given fifteen men in the sand, gravel, and stone business. City water is used for drinking and fire purposes and raw river water for industrial purposes. Barges from New Jersey ports, principally Bordentown and Rancocas Creek, bring in the material. They get their drinking water from the Delaware River at Florence, New Jersey.

The fourteenth bulkhead is owned by the George B. Newton Coal Company, coal dealers. Eight men are employed and city water is supplied for all purposes. Coal is brought in by canal boats from Port Clinton on the Schuylkill River, said to obtain drinking water from the canal above Reading, and by barges from Trenton, New Jersey, and Port Richmond and Greenwich Point in Philadelphia.

The fifteenth bulkhead is owned by the Pennsylvania Railroad Company and leased by the West Philadelphia Stock Yards Company which employes two hundred men. City water is furnished for drinking and manufacturing purposes, the plant being known as the Consolidated Dressed Beef Company. Raw river water is used for cooling and in the fire lines. In the stockyards city water is not furnished. At this plant there was formerly a six inch connection between the city and raw river water lines separated by a check only. This was being changed at the time of the Department's inspection and hereafter city water will be supplied to the stock and there will be no connection whatever between the raw water lines and the city water lines. For the past twelve months boats have not docked at the wharf. Bottled water is furnished at the offices.

The sixteenth bulkhead is owned by the Philadelphia and Reading Railway Company and leased by Henry Holt, six men being employed here. Manure is stored here after being collected throughout the city. It is then placed upon barges and towed to New Jersey ports for disposal. Three tug boats and six barges are kept busy all the time. City water is used for drinking and fire purposes at the wharf but the boats get raw river water.

On the seventeenth bulkhead, leased from the same railroad by the Barber Asphalt Company, eighty men are employed. City water is used for all purposes except that bottled spring water is supplied at the office. Five barges, owned by the company, and others bring in sand, stone, and gravel from New Jersey ports. Vessels bring asphalt from Central America and dock at the wharf. Some of these vessels get water from the company. The barges take it principally from the Delaware River opposite Florence, New Jersey.

The eighteenth bulkhead is owned by the Atlantic Refining Company and barges dock here. The wharf is used for storage purposes with four men employed. City water only is supplied.

At the nineteenth bulkhead, owned by Mrs J. J. Clancy, the business of conducting a dump for manure and transporting it to New Jersey ports is pursued. City water is supplied to the pier but none is furnished the vessels. One man oversees the work.

The twentieth bulkhead is also a manure wharf and is leased from the Philadelphia and Reading Railway Company, and occupied by Joseph Burke, who owns three barges and two tugs which are kept busy all the time. Four men are employed on the wharf and city water only is supplied. The boats get their water from the Delaware River.

The twenty-first bulkhead is leased from the same company by Bernard Connard who runs a manure business, selling this product at various New Jersey ports. He has city water on the pier but the boats get raw river water.

The twenty-second bulkhead, the last one upstream, is near the Spring Garden Street bridge and is occupied by Peoples Brothers, being leased from the Philadelphia and Reading Railway Company. Twenty men are employed. It is a dump for street sweepings, ashes, and earth, or any other dry material suitable for filling. Four barges, owned by the firm are kept busy. City water is supplied at the wharf and in the repair shops located here. The barge casks are filled with this water.

DISCUSSION AND CONCLUSIONS.

From the facts herein set forth it appears that the public health is jeopardized by the use of sewage polluted water of the Delaware and Schuylkill Rivers. Such water is a menace because it is drunk in its raw state, in some cases knowingly and in other cases innocently. It is also a menace because it comes in contact with vessels, utensils, and appurtenances used in handling, conveyance, and storage of the drinking water supply.

The drinking of raw river water by choice is practised by the crews on tow barges, by officers and crews of various tug boats, coast wise vessels, and tramp steamships and by some of the officers and crews of the river steamboats engaged in carrying passengers and freight. This season some of these indicated above paid the penalty by contracting typhoid, the circumstances warranting the attributing of the disease to this origin. It would be serious enough if this practice involved only the health of those who drank this polluted water, but the danger does not stop here, since the disease is communicable and hence the interests of the public health apparently demand the promulgation of rules and regulations, backed up by proper inspection, to compel the abandonment of the practice or to reduce it to a minimum.

But when the practice of supplying raw river water to tanks, barrels, and water coolers for others to drink, who do not know the source of this water supply, is permitted to exist, a very extensive menace to public health prevails. It has here been shown that water boats find it convenient knowingly to replenish depleted supplies in their tanks with raw river water. Even if they did not have recourse to this water, the apparatus on such boats including the hose and the single pumping engine is used alternately for pumping raw river water for inferior purposes such as washing down decks, or to the boilers, and then to deliver the city water into the tanks or from the tanks into the retainers on the vessels purchasing the supply. By this practice there is a dire possibility that a pure drinking water may be contaminated by the raw river water and all the drinking water supplied to the passengers in this manner be rendered dangerous.

Furthermore there is no evidence that the buckets used by numerous steamboats to fill the water barrels and tanks from which the drinking water is drawn are not dirty and contaminated by previous contact with the raw river water, in fact there is good reason to believe that such is the case. On many of these river boats dirty ice, handled by crews whose habits are uncleanly, is placed in direct contact with the drinking water, this ice sometimes being washed in the Delaware River before it is put in the containers. Again the dipping of water from the barrels is not uncommon and gross carelessness has been observed, as would be expected, in keeping the dipper clean.

With few exceptions the water hose used for pumping the drinking water has been used for other purposes. The greater number of the vessels docking at Philadelphia depend altogether on the water boats of the river for their supply of drinking water.

The investigation shows that several things are needed in the ports of Philadelphia to better the conditions as relates to the water supply used along the rivers.

Ample facilities should be provided for supplying pure city water for drinking purposes at all the piers, docks, and wharves where drinking water is needed and this supply to the public on the piers or vessels should be regulated in such a way as to assure the purity of the water to the consumer. This means a supervision of the facilities afforded for the delivery of the water.

The dipping of all water from containers should be stopped and the placing of ice in contact with the water should also be prohibited. Pumps, hose, buckets, and other apparatus used in connection with the drinking water service should be exclusively used for this purpose whether on water boats, vessels of all descriptions or on the piers.

It should be compulsory for all owners or operators of wharves, docks, and boats to provide pure water for drinking purposes in containers of approved pattern and all places where employees or the public might obtain raw river water from pipe lines or apparatus conveying such water should be placarded with a warning sign against the use thereof.

The dual system of piping which permits the use of pure water or raw river water at choice through the manipulation of valves, whether at the piers or on boats, should be prohibited and the two systems of piping with all their appurtenances should be kept separate.

The water boats are encouraged to draw raw river water at night because the municipal piers are not open and the water hydrants are not available until eight o'clock in the morning. Arrangements should be made by the city to maintain this water service throughout the twenty-four hours of the day at one or more piers.

In carrying out these regulations the City Water Bureau, the City Board of Health, and the Department of Wharves, Docks, and Ferries must cooperate. The Health Departments of Pennsylvania, New Jersey and Delaware might agree on a uniform regulation that would extend beyond the port of Philadelphia all along the Delaware River and in Pennsylvania to the canal boat traffic on the Schuylkill, Lehigh and Delaware Rivers canals. Furthermore the Federal Government might take up the work of supervising such craft and practices.

In the tables following the detailed data already given are shown in summarized form:

TABULATION OF THE USE OF WATER ON PIERS SOUTH OF MARKET STREET.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
No. 1. Porter-Gildersleeve Company, Lessee.	4	None on pier				—	—	+ *	—	None				—
No. 3. Five Lessees: Atlantic Fruit Co., U. S. Government, Frederica-Phila. Navigation Co., Milford Navigation Company, Ericsson Line.	200	+	+	—	—	—	—	—	+	None				+
No. 5.* Two Lessees: Wilmington Steamship Company (Wilson Line), Del. R. Transit Co. Double deck, upper deck for recreation.	20	+	+	+	—	None				None				+
P. & R. Ry. Co., ferry slips,....	30	+	+	+	—	—	—	—	+	None				+
No. 8. P. & R. Ry. Co., Chestnut Street freight transfer and station.	250	+	+	—	—	None				None				+
No. 9. George W. Bush & Sons Company, Lessee.	30	+	—	—	—	None				None				—
Nos. 10-11-14. P. R. R. Co., ...	125	+	+	+	—	None				None				+
No. 16. City of Philadelphia (double deck).	20													
Nos. 18-20. Merchants and Miners Trans. Co., Lessees.	150	+	+	—	—	None				None				+

PIERS AND VESSELS:—DELAWARE RIVER.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
One tug.	+	—	—	—	—	+	None			None	*Hand pump. No crews on lighters. Tug gets drinking water various places, presumably city water.
Six deck lighters; river.	None			None			None			None	
Atlantic Fruit Co.; six vessels (freight only); West Indian trade.	None from pier*			—	+	+	None			None	*These lines get drinking water at southern ports.
One U. S. Revenue Cutter; river.	+	—	—	—	+	+	None			None	
Frederica-Philladelphia Navigation Company; one steamer (passenger and freight); river.	None from pier			—	+	+	+	—	—	None	
Milford Navigation Co.; one steamer (freight only); river.	None from pier			—	+	+	None			None	
Ericsson Line; four steamers (passenger and freight); river, canal, etc.	+*	—	—	—	+	+	None			None	
Wilson Line (four steamers to Wilmington); (passenger and freight); river.	Wilmington City water						None			None	*City recreation pier. Upper deck much frequented in summer, with a maximum of 600 visitors daily.
Delaware River Transportation Company; four steamers; to Trenton; (passenger and freight); river.				+[1]	+	+	None			None	(1) One boat uses Delaware river water for drinking. One boat out of service.
Kaign's Point Ferries; three ferry boats; to Camden (passenger and freight); river.	None*			+	+		None			None	*Drinking water for crews from Camden; in buckets; none for passengers.
Several hundred float barges; freight; river.	No water nor crews on barges.										Barges used for transfer of freight cars.
"Warner Line"; three steamers: "Alice," "Christina," "West River." Two barges; one tug; to Wilmington; freight; river.	+	—	—	—	+	+	None			None	"Alice"—Mostly Wilmington water; occasionally Philadelphia city water. "Christina"—gets both supplies. "West River"—Philadelphia city water only. Other boats get both supplies.
Several hundred float barges; freight; river.	No water nor crews on barges.										Barges for transfer of freight cars.
											Pier not completed. Water for workmen building pier is carried onto pier in buckets.
Eleven steamers; passenger; freight; coastwise.	+*	—	—	—	+	+	None			None	*Drinking water also received at northern ports.

TABULATION OF THE USE OF WATER ON PIERS

PIERS SOUTH OF MARKET STREET.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
No. 22. B. & O. R. R. Co., ...	30	+	+	—	—	None				None				+
No. 24. Merchant and Miners Trans. Co., Lessees.	100	+	+	—	—	None				None				—
South Street Ferry Slips. P. & R. Ry. Co., ...	24	+	+	+	+	None				None				—
Gloucester Ferry Co., ...	16	+	+	+		None				None				
No. 28. Independent Pier Company, Lessee.	100	None				—	+*	—	—	None				—
No. 30. Franklin Sugar Refining Company.	0	None				None				None				—
Nos. 31-32-33.	Owned by Franklin Sugar Refining Company.													
No. 34. Independent Pier Company, Lessee and Agents for Lines (a) and (b).	200	+	+	—	—	None				None				—
No. 35. Independent Pier Company, Lessee.	0	None				None				None				—
No. 38 (New). P. & R. Ry. Co., ...	150	+	+	—	—	None				None				—
No 38 (Old).* P. & R. Ry. Co., ...		Same as No. 38 (New)												
No. 39. American Ice Company, ...	25	+	—	—	—	None				None				—

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Float work. Freight; river; *remarks.	No crews nor water on barges.										Barges used for transfer of freight cars. Merchant and Miners Company steamers also tie up here for freight transfer.
Savannah and Jacksonville Line; four steamers; passenger; freight; coastwise.	+*	−	−	−	+	+	None			None	Steamers take drinking water at southern ports also.
Kaign's Point Ferry. Two ferry boats (P. & R. Ry. Co.); passenger; freight; river.	+*	−	−	−	+	+	None			None	*Camden and Gloucester water also used on both lines.
Gloucester Ferry. Three ferry boats; passenger; freight; river.	+*	−	−	−	+	+	None			None	
Tie-up pier for tramp steamers; coastwise and trans-Atlantic freight transfer.	None			None			None			None	No drinking water furnished vessels at this pier. *River water pumped from Sugar Plant.
No lessee (*).	No water on pier.										*Uncovered, short pier not regularly operated; any boat may use pier.
	Data for No. 30 apply here.										
(a) North German Lloyd Line. Twenty-six steamers; to Germany; passenger and freight; transatlantic.	+*	−	−	−	+	+	None			None	*Tugs "Active" and "Triton" are combined tugs and water boats and sell water to vessels.
(b) Austro-American Line. Eight steamers; to Mediterranean; passenger; freight; transatlantic.	+*	−	−	−	+	+	None			None	Liners and tramps docking here also obtain water at foreign ports.
Tramp steamers (transatlantic).	+*	−	−	−	+	+	None			None	
Three Tugs. River: "Active,"* "Neptune," "Triton."*	+	−	−	−	+	+	None			None	
											No water on pier which is used by tramp steamships in general freight business. Several hundred vessels tie up here annually.
Float barges. Freight; river.	No crews nor water on barges.										Barges used for transfer of freight cars.
											*Sold to city and about to be abandoned.
Sailing vessels: coastwise; carrying ice from Maine and New York.	None			None			None			None	Vessels do not take water at pier.

TABULATION OF THE USE OF WATER ON PIERS

PIERS SOUTH OF MARKET STREET.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
No. 40. Phila. Harbor Transfer Co., Lessee.	10	No water on pier.												—
No. 41. Southern Steamship Co., Lessee.	40	+	+	—	—	None				None				—
Nos. 43-44. City of Phiadelphia, ...														
Nos. 46-48-53-55-57. International Mercantile Marine Company, Lessee.	300	+	—	—	—	—	+	—	—	None				—
Nos. 59-60-61. Spreckels Sugar Refining Company.	1,000	+	—	—	—	—	+	—	+	None*				
Nos. 62-63. B. & O. R. R. Co., ...	10	+	—	—	+	None				None				—
No. 64. (Tasker St. Wharf), David France & Company.	12	—	—	—	+*	None				None				—
Nos. 67-68-69. Wm. J. McCahan Sugar Refining Company.	400	+	—	—	—	—	+	—	+*	None				—
Nos. 70-72. Baugh & Sons Company (Chemical and Fertilizer Plant).	450	+	—	—	+	—	+	—	+*	—	—	—	+	—

AND VESSELS:—DELAWARE RIVER—Continued

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Uncovered, short pier, for river boats for freight transfer.	Used as tie-up point for general freight business.										Pier to be torn down shortly by city.
Southern Steamship Co. Line. Eight steamers; freight; coastwise.	+	−	−	−	+	+	None			None	Line of steamers to Charleston, Jacksonville, Tampa, and Port Arthur.
											Closed. Condemned and to be demolished.
Southern Steamship Co. To South American ports; passenger; freight.	+	−	−	−	+	+	None			None	The liners also buy water from river-boats. There is a United States Immigrant Station on No. 53.
South Atlantic. American Line. To European ports; passenger; freight; transatlantic.	+	−	−	−	+	+	None			None	
Atlantic Transport Line. To Southampton; passenger; freight; transatlantic.	+	−	−	−	+	+	None			None	
Holland-American Line. To Holland; passenger; freight; transatlantic.	+	−	−	−	+	+	None			None	
Red Star Line. To European ports; passenger; freight; transatlantic.	+	−	−	−	+	+	None			None	
Freight steamers from West Indian and South American ports; carrying sugar. Carribean, etc. Freight only.	None			−	+	+	None			None	*Abandoned well on premises, 48 million gallons daily Delaware river water used in sugar plant. No dual pipe connections; factory at rear of pier. Vessels get water from water-boats.
Float barges.	No crews nor water on barges.										Barges used for transfer of freight cars.
Sand barges. Delaware river and Chesapeake bay ports; river, etc.	+	−	−	+*	−	−	−	−	−	None	*Have steam shovel on pier. Captains of barges take Delaware river water for drinking. Also get supply from various ports.
Freight steamers from West Indian and South American ports. Carrying sugar. Carribean, etc.; freight only.	None*			−	+	+	None			None	*River water for boilers and condensing. No water from pier. Buy from water-boats. Factory at rear of pier.
Freight boats, tramps, steamers and sailing vessels; to all ports; coastwise; transatlantic; river.	No water to vessels from pier.										*River water for boilers. Drilled well on premises. Report "No connection between river and city water lines."

TABULATION OF THE USE OF WATER ON PIERS

PIERS SOUTH OF MARKET STREET.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
Nos. 73-74-75. Philadelphia Ship Repair Company.	150	None on pier				None				+	+	−	+	−
No. 80. B. & O. R. R. Co., ...	Pier burned; not in service.													
No. 81. B. & O. R. R. Co. (Coal Wharf),	20	+	−	−	−	−	+*	−	−	None				−
Nos. 92-93-94. Penna. Salt Manufacturing Company.	700	+	−	−	−	+	+*	−	+	None				−
No. 103. General Manufacturing Co., Lessee. Fertilizer Plant.	50	None				+*				+			+	−
Nos. 104-105. American Agricultural Chemical Company. Fertilizer and Acid Works.	200	None				+*	+	+	−	(Remarks)				−
Nos. 106 to 111 (Inclusive). P. R. R. Co. (Greenwich Coal Piers).	500	None				+	+*	−	+	None				(a)
Point House Wharf. P. R. R. Co. (Lumber and Tie Pier).	*	None				−	+*	−	−	+	−	−	−	−
Bulkhead P. R. R. Co. (Creosoting Plant).	40	None				+		+	+					−

PIERS NORTH OF MARKET STREET TO PORT RICHMOND.

Market Street Ferry Slips, P. R. R.	100	+		+	*		+	+	*	None				−

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Boats for repair. All kinds.	None			—	+	+	+	—	—	None	Two floating dry docks Shops at rear of piers. Drilled well on premises.
Any kind of vessels dock for coaling purposes.	None on pier			—	—	—	—	—	—	—	*River water pumped to tank; piped about plant; used by locomotives. Pipe systems separate.
Freight boats. All descriptions. River and ocean.	Cannot get water at pier.										*Employes have access to river water supply. Placards posted. Make sulphuric acid, alums, and copper compounds. Plant rear of pier.
Barges only. Two men on each barge; river.	No water from pier.										*River water for fire service from American Agricultural Chemical Company plant nearby. Freight barges with animal wastes dock here.
Ocean and river freighters; all kinds.	No water from piers.										Plant at rear of pier. *River water distilled for drinking. Two drilled wells on premises, abandoned.
All kind of vessels dock here for coaling purposes.	No water from piers.										*River water pumped to tanks thence piped about plant; used by employees. Water boats supply vessels while coaling here. a. Melted ice used in office.
Lumber boats, coastwise and river, with raw material dock here.	No water from piers.										*Water taken from Creosoting plant adjoining. *Employees here are train and vessel crews.
Chartered railroad boats get cargo here; river.	No water from pier.										*River water piped to two houses at rear of wharf for general use by employees of company.
Six ferry boats to Camden.	No water on vessels.										*City water for drinking and lavatory purposes, except flushing for which river water is used.

TABULATION OF THE USE OF WATER ON PIERS

PIERS NORTH OF MARKET STREET TO PORT RICHMOND.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												
		City Water.				River Water.				Well Water.				Bottled.
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
Nos. 1-2-3. Lessees: Clyde Steamship Company of Maine.	600	+	+	—	—	None				None				+
No. 4. Lessees: (a) Chester Shipping Company.	20	+	+	—	—	—	—	+*	—	None				+
(b) Philadelphia - Rancocas - Mt. Holly Trans. Company.	6													
(c) Bridgeton Steamship Company.	4													
(d) Odessa Steamboat Company,	6													
(e) Smyrna Steamboat Company,	3													
(f) Philadelphia-Salem Freight Company.	7													
(g) See Remarks.														
No. 5. Lessees: (a) United Fruit Company	150	+	+	—	—	—	—	—	+	None				—
(b) Lebanon Navigation Co.														
No. 8. Lessees: (a) Sun Oil Company, ... (b) Commonwealth of Pennsylvania. (c) Harbor Transfer Company, (d) L. V. R. R. Company, (Owner).	60	No water on pier.												
No. 10. Lessees: (a) Cuneo Importing Company,..	30	+	+	—	—	None				None				—
(b) Trenton Transportation Company														
(c) City of Philadelphia (Owner).														

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Freight steamers only; coastwise; lines to Southern ports: New York, Boston and New England; twenty boats.	*			—	+	+	None			None	*No water supplied to vessels at these piers.
(a) Three steamers; to Chester; freight; river.	+	—	—	+	+	+	None			None	(a) These steamers occasionally get Delaware river water at Lincoln Park, N. J., for all purposes.
(b) Van Sciver Line; one steamer "Admiral;" to Mt. Holly; freight; river.	+	—	—	—	+	+	None			None	(b) Steamer got water from Delaware river early part of year 1913.
(c) One steamer "Prospect"; to Bridgeton; passenger; freight; river.	+	—	—	+	+	+	None			None	(c) At times got Delaware river water at Lincoln Park, N. J.
(d) One steamer "Clio"; to Odessa; passenger; freight; river.	—	—	—	—	+	+	+ (Rem)			None	(d) Steamer gets drinking water from "Cannery" well at Odessa.
(e) One steamer "Frankie;" to Smyrna; freight; river.	—	—	—	—	+	+	+ (Rem)			None	(e) Steamer uses well water obtained from dock at Smyrna.
(f) Two steamers "City of Salem" and "Adelaide;" passenger; freight; to Salem and Baltimore; river, canal, etc.	+	—	—	—	+	+	None			None	(f) "City of Salem" uses city water generally; Philadelphia or Baltimore water occasionally. (g) Steamers "Sylvan Glen" and "Sylvan Dell"; excursion boats; Philadelphia to Washington Park; May to September. Steamers "Columbia"; excursion. Philadelphia to Trenton; May to September. Pump.
(a) Fourteen steamers; passenger; freight; fruit trade; to West Indies; Carribean, etc.	+	—	—	—	+	+	None			None	
(b) One steamer; passenger; freight; to Lebanon; Del. river.	—	—	—	—	—	—	—			—	
(a) Lighters only; freight; river.	+	—	—	—	+	+	None			None	*Water from municipal wharf at Race street.
(b) Harbor Master; patrol boat; river.	+*	—	—	—	+	+	None			None	
(c) Lighters only; freight; river.	No water			—	—	—	—			—	
(d) Car floats; freight; river.	No water			—	—	—	—			—	
(a) Six steamers; to West Indies; freight; Carribean, etc.	+	—	—	—	+	+	None			None	*One steam barge uses Trenton water only. Water boats at times get water at this pier. This is a double-deck recreation pier.
(b) Four steam barges; to Trenton; freight; river.	+*	—	—	—	—	—	—			—	
(c) Two city fire boats; river.							—			—	

TABULATION OF THE USE OF WATER ON PIERS

PIERS NORTH OF MARKET STREET TO PORT RICHMOND.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
Nos. 11-12. B. & O. R. R. Co., ...	75	+	+	-	-	None				None				-
Nos. 13-14-15. P. R. R. Co., ...	380	+	+	-	-	None				None				-
Vine Street Ferry Slips. P. R. R., ...	34	+	+	-	-	-	-	-	+*	None				-
No. 19. Lessees: (a) Italian Lines Company, ... (b) Philadelphia & New Orleans Co. See also Remarks.	400	+	+	-	-	None				None				-
No. 24. Allan Line Steamship Company, Lessee.	200	+	+	-	-	None				None				-
No. 25. Lessees: (a) Philadelphia Transatlantic Line. (b) Bull Line.	200	+	+	-	-	None				None				-
No. 27. Lessees: (a) Holland-American Line. .... (b) Scandanavian Line.	250	+	+	-	-	None				None				-
Nos. 29-30. "Apple Yard," P. & R. Ry. Co.,	30	+(Office only)				None				None				-
No. 31. Alex. Kerr Brothers & Company, Lessee.	20	+*	-	-	-	No water on pier which								
No. 32. Geo. W. Kugler and Sons Company, Lessee.	10	+*	-	-	-	No water on pier								
Nos. 33-34. Philadelphia Rapid Transit Company.	30	-	+	-	-	None				None				-

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Barges only; freight; river.	Barges carry no water nor crews.										Barges used for freight transfer.
Barges only; freight; river.	Barges carry no water nor crews.										Barges used for freight transfer.
Three ferry boats; to Camden; passenger; freight; river.	None			−	−	+	None			None	*Raw river water at heating plant; no dual connection. Crews on boats use Camden city water; public not supplied.
(a) Ten steamers; four lines; passenger; freight; transatlantic. (1) Italian line. (2) The La Veloce Co. (3) The Navigazione Generale Italiana Company. (4) Lloyd Italiano Co.	+	−	−	−	−	+	None			None	(a) Liners take water at other ports. (b) Boats not allowed to take water at other ports. United States Immigration Station on this pier.
(b) Three steamers; to Charleston and New Orleans; coastwise; freight.	+	−	−	−	−	+	None			None	
Three steamers to St. Johns, Halifax, Glasgow and Liverpool; passenger and freight. Coastwise; transatlantic.	+*	−	−	−	−	+	None			None	*Vessels also get water at other ports.
(a) Four steamers to London; Transatlantic; freight.	+	−	−	−	−	+	None			None	*Solely an import pier.
(b) Four steamers to Scotland; transatlantic; freight.	+	−	−	−	−	+	None			None	
(a) Four steamers; to Rotterdam; transatlantic; freight.	+*	−	−	−	−	+	None			None	*Solely an Import pier. Vessels get city water at Port Richmond.
(b) Four steamers to Copenhagen; transatlantic; freight.	+*	−	−	−	−	+	None			None	
No boats dock here.											Two open short piers; storage only. Water in office only.
Is used for storage of salt only.											*Water for employees brought on in buckets (city supply).
Lumber barges; freight only. Coastwise and river.	None			None			None			None	*Water for employees brought on in buckets (city supply).
Tramp steamers; schooners; barges; freight (*); coastwise and river.	None			None			None			None	*These vessels bring in ties, stone and sand.

TABULATION OF THE USE OF WATER ON PIERS

PIERS NORTH OF MARKET STREET TO PORT RICHMOND.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
No. 35. Cornworth Bell Company, Lessee,	20	+*	—	—	—	No water on pier								—
No. 35½. American Ice Company, Lessee,	50	+	—	—	—	—	+	—	—	None				—
No. 36. Chas. F. Felin & Co., Lessees,	10	+	—	—	—	—	+	—	—	None				—
Nos. 37-38. Henson & Nichols,	40	+	+	—	—	No water on pier No. 37.				None				+
No. 39. Clayton W. Nichols,	16	+	+	—	—	—	+	—	—	None				—
No. 40. B. & O. R. R. Co., Lessee,	12	+	+	—	—	None				None				—
No. 41. Philadelphia Rapid Transit Company, Lessee.	7	No water on pier.												+
No. 42. Chas. F. Felin & Co., Lessee,	60	+	+	—	—	—	+	—	—	None				+
No. 43. P. & R. Ry. Co., Laurel Street Freight Station.	2	+	+	—	+	None				None				—
No. 44. Watson Malone & Sons, Lessee,	14	+	+	—	—	None				None				—
No. 45. J. W. Paxson Company,	50	+	—	—	—	—	+	—	+	None				—
No. 46. Pennsylvania Sugar Company,	700	+	+	—	—	—	—	—	+*	None				—
No. 47. Geo. W. Gormley,	25	+	—	—	+	None				None				—
Nos. 48-49-50. P. R. R. Co.,	140	+	—	+	—	None				None				—
Shackamaxon Ferry Slips, P. R. R. Co.	7	+	+	—	—	None				None				—

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Lumber barges; freight; river.	Barges get no water here.										*City water for employes brought on pier in buckets. Short covered pier for lumber storage only.
Sailing vessels bring in ice; coastwise and river.	+*	—	—	None			None			None	Vessels get no water here. Reported as buying from water boats.
Vessels; coastwise and river; bring in lumber.	+*	—	—	None			None			None	Vessels cannot get water here.
Vessels; coastwise and river; bring in lumber.	Boats cannot get water here.										
Lumber vessels; coastwise and river; freight only.	Boats cannot get water here.										Box factory on wharf. Barges docking here get Delaware river water near Wilmington.
Float barges; river; freight; freight transfer.	No crews nor water on barges.										Towing tugs cannot get water at this pier.
Coal barges; river freight.	Barges cannot get water here.										Short, open pier.
Steamers, sailing vessels and barges; coastwise and river freight.	Vessels docking here get water elsewhere.										
Steamers, sailing vessels, barges; river; freight.	+	—	—	—	—	+	None			None	
Steamers and sailing vessels; coastwise; freight.	Vessels get no water here; buy from water boats.										
Twenty steam barges; river; freight (sand and gravel).	None			+*	—	—	None			None	*Short pier; barges get water from Delaware river near Wilmington and Lardner's point.
Steamers. To European and West Indian ports. Freight only.	+			None			None			None	*River water filtered at plant.
Scows and barges; river; freight.	+			None			None			None	Short pier.
Freight boats dock here; Coastwise; transatlantic and river.	Ocean going boats buy water from water boats.										Pier No. 48 is a short pier.
One ferry boat; to Cramer Hill; Camden; passenger; freight; river.	None*			—	—	+	None			None	*For crew on boat Camden city water is supplied; none for public.

TABULATION OF THE USE OF WATER ON PIERS

PIERS NORTH OF MARKET STREET TO PORT RICHMOND.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
No. 51. S. V. Vrooman & Company, Saw and Planing Mill.	35	+	−	−	−	−	+	−	+	None				−
No. 52. J. W. Janney, ...	7	+	−	+	−	None				None				−
No. 53. Frank Merrihew & Son, Lessees.	20	+	−	−	−	−	+	−	+	None				−
No. 54. General Chemical Company, Lessee.	15	+	−	+	−	−	+	−	−	None				−
No. 55. American Ice Company, Lessee,..	30	+	−	−	−	−	+	−	−	None				−
No. 56 Chas. Lennig & Company, Lessee.	10	River water on pier in buckets for fire. None otherwise.												−
No. 57. City of Philadelphia Recreation Pier and fire boat station.	15	+*	−	−	−	None				None				−
Nos. 59-60-61. Philadelphia Electric Company,..		Piers not operated.												
No. 61½. Porter-Gildersleeve Company, ...	10	None				−	+*	+	−	None				−
Nos. 62-65. Nos. 62½-63-63½. Kensington Shipyard Company, Lessee.	1,000	+				−	+	+	+	None				−
		No water on these three piers.												
No. 66. Hughes & Patterson Rolling Mill,		+	−	−	−	−	+	−	+*					
No. 67. De Frain Sand Company, Building Materials.	80	+	−	−	−	−	+	+	−	None				+
Nos. 68-69. Wm. M. Lloyd Lumber, ...	30	+	+	−	−	−	+	−	−	None				−
No. 70. City of Philadelphia, owner Recreation pier and Susquehanna Avenue Ferry Slip. Morgan & Hansbury, Lessee.	12	+	+	−	−	−	+	−	−	None				−

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Freight boats; coastwise and river.	Vessels get water from water boats.										
Freight boats; coastwise and river.	Vessels usually buy water from water boats but can obtain it at pier.										
Coal barges; freight; river.	None			+*	–	–	None			None	*Barges get water from North Delaware river.
Private freight ferry; no water used.											
Lumber barges; river; freight.	+	–	–	None			None			None	
Freight boats; coastwise and river.	Boats do not obtain water at pier.										Barges obtain water from South Delaware river.
Fire boat: "W. S. Stokely;" river.	+	–	–	–	–	+	None			None	*From hydrant in park adjoining pier; just south of pier the water boats obtain water from fire hydrant.
Deck Lighters; freight; river.	None			None			None			None	*Hand pump. This pier is a public dump for street refuse.
Ships of all kinds dock here for general repair work.	+	–	–	None			None			None	Vessels, being repaired, get water supply from these piers. Prior to September 11th, 1913, a dual pipe connection existed here.
	Pier not in operation; rolling mill shut down.										*When mill operates river water is used generally for manufacturing purposes; city water for drinking.
Sand and gravel barges; freight; river.	None			+*	–	–	None			None	*Barges obtain water from North Delaware river.
All types of lumber vessels; coastwise and river; freight.	Vessels get no water here; patronize water boats.										
One ferry boat; passenger and freight; river; to Cramer Hill, Camden.	+*	–	–	–	–	+	None			None	*For crews only. Pier also used as storage house and supply yard of Third District of City Water Bureau.

TABULATION OF THE USE OF WATER ON PIERS

PIERS NORTH OF MARKET STREET TO PORT RICHMOND.

Pier Number and Occupant.	Number employed on pier.	ON PIERS.												Bottled.
		City Water.				River Water.				Well Water.				
		Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Drinking.	Fire.	Washing.	Industrial.	Office.
No. 71. Two Lessees: (a) Seaman & Menaugh. ..... (b) Wm. McAllister.	10	+	−	−	−	−	+	−	−	None				None
No. 72. Hainesport Mining and Transportation Company, Lessee.	30	No water on pier												
Nos. 75-76. B. and S. Transportation Co., Lessee. Towing.	20	+	+	+	−	None				None				−
Nos. 77 to 83, inclusive, 85-86 and No. 20 (Port Richmond Pier). Wm. Cramp & Sons Engine Building Company.	5,000	+	+	+	−	−	+	−	+	None				−

PIERS NORTH OF MARKET STREET—PORT RICHMOND TO CITY LINE

Nos. 1 to 14, inclusive, 16-18, and Piers A, B, C, D, G, H, J. P. & R. Ry. Co., owner, Port Richmond Terminal.	1,700	+	+	−	−	−	+*	−	+	None				−
One Pier (Unnumbered). Foot of Allegheny Avenue, city of Philadelphia, owner. Recreation Pier.	No water on pier.													
Nos. 171-173. Pearson & Ludascher Lumber Company, Lessee.	50	+	−	−	−	−	+	−	+	None				+
Two Piers (Unnumbered). Foot of Tioga Street, United Gas Improvement Company, Lessee, 25th Ward Gas Works.	350	+	−	+	−	−	+	−	+	None				−
One Pier (Unnumbered). Foot of Venango Street. M. L. Shoemaker & Co., Manufacture Fertilizers.	125	+	−	−	−	−	+	−	+				+	−

AND VESSELS:—DELAWARE RIVER—Continued.

VESSEL OR LINE. Coastwise, Transatlantic, Etc. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Well Water. Drinking.	Well Water. Washing.	Well Water. Boilers.	Bottled.	Remarks.
Lumber boats; freight only; coatswise and river.	Do not get water at this pier.										
Float and steam barges; freight only; river.	Barges do not get water here.										
Canal boats, barges, and tugs; freight; river.	None			+*	−	+	None			None	*Boats pump water from river at pier.
All kinds of vessels built here, including men-of-war.	+*	−	−	−	−	+	None			None	*Piers 79, 83, 85 and 86 have river water intakes; warning signs printed in six languages, posted at all river taps.
All kinds of craft; coastwise, transatlantic and river; dock here. Freight only. Piers A, B, C, D, are export piers and leased by:— (1) Allan Line. (2) Phila. Transatlantic Line. (3) Bull Line. (4) Holland-American Line. (5) Scandanavian Line.	+	−	−	−	−	+	None			None	*On piers Nos. 12 and 14. On pier No. 12 is a grain elevator. Piers Nos. 13-14 are iron ore wharves. Piers G-H used for general heavy freight business. Pier J for car transfer floats. Dual pipe connections severed in 1913.
It is used as landing for small river passenger boats.											
Freight boats; coastwise and river.	Boats cannot get water at these piers.										
Coal barges; freight only; river.	Barges cannot get water at these piers.										Employees have access to river water; no warning notices posted.
Deck lighters; freight; river.	Lighters cannot get water at this pier.										

TABULATION OF THE USE OF WATER ON BULKHEADS ALONG EAST BANK.

OCCUPANT OF BULKHEAD.	Number employed.	ON BULKHEADS.										
		City Water.			River Water.			Well or Spring Water.			Bottled.	
		Drinking.	Fire.	Industrial.	Drinking.	Fire.	Industrial.	Drinking.	Fire.	Industrial.	Office.	
Girard Point Storage Company—Grain Elevators.	80	None		—	—	+	+	(*)	—	—	—	
Peoples Brothers, Lessee, Street Refuse Dump.	6	None		—	—	(*)	+	+	(a)	—	—	
Atlantic Refining Company, ...	2,000	+	—	—	(*)	+	+	None		—	—	
United Gas Improvement Company—Lessee.	400	+	—	—	—	+	+	None		—	—	
American Incinerating Company,		Plant shut down										
Philadelphia Rubber Co., ...	125	+	—	—	(*)	+	+	None		—	+	
Barrett Mfg. Company, Lessee,..	200	+	—	—	—	+	+	None		—	—	
D. B. Martin Company, Abattoir.	50	+	+	+	—	(*)	+	None		—	+	
Harrison Brothers & Company, Chemical Works.	300	+	(*) +	—	—	(a) +	+	None		—	—	
The Frederick R. Gerry Company, Builders & Contractors.	300	+	—	—	—	+	+	None		—	—	
United States Government Arsenal.	800	+	+	(*) +	None		—	None		—	—	
Phila. Electric Co., Station "A,"	50	+	(*)	—	—	+	+	None		—	—	
De Frain Sand Company, ...	40	+	+	—	None			None			—	
Phila. Rapid Transit Co. Way Shop.	80	+	+	+	None			None			—	
John C. Hancock, Lessee, Coal Yards.	25	+	+	—	None			None			+	
H. C. Fox & Sons, Inc., Glass Mfrs.	375	+	+	—	—	(*)	+	None			—	
George B. Newton Coal Company,	21	+	—	—	—	+	+	None			—	
Charles F. Felin and Co., Lessee, Lumber Yard.	2	No water supply										
George B. Newton Coal Co., Lessee.	18	+	+	—	—	—	+	None			—	
Samuel E. and J. J. Donaghy Coal Yard.	15	+	+	—	—	—	+	None			—	

BULKHEADS AND VESSELS:—SCHUYLKILL RIVER.

VESSELS. Coastwise. Transatlantic. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Remarks.
Grain vessels (chartered). Coastwise and Transatlantic.	+	(a)	—	None		—	*Drilled well. (a) Vessels get water from water boats when in this port.
River Scows—hauling street refuse from various wharves along rivers.	None		—	None		—	*For boilers. (a) Scow crews get water at times from well at Penrose Ferry Bridge Hotel.
Nearly three hundred oil vessels (all chartered) — (Coast-wise) dock at bulkheads of this company. Annually — Company owns three tugs and five barges—River.	+	(a)	—	None		—	*River water filtered at plant. (a) City water supplied by company's tugs, two being water boats.
Five Coal Barges—River—dock here weekly—also six sand barges—yearly.	+	—	—	None		—	
No vessels dock here, ...							*River water filtered at plant.
Schooners from Central America and coal and sand barges—River—dock here.	Get no water here		—				Schooners bring asphalt from Central America. Sand barges get Delaware river water at Florence, N. J. Coal barges bring coal from Delaware river piers.
Coal and sand barges and schooners—River—dock here occasionally.	Get no water here		—				*River water used for washing floors.
Four Tramp Steamers dock here annually — Classification unknown. Coal and sand barges —River.	Get no water here		—				*Refiltered at plant. (a) For boilers—filtered at plant.
Four lumber Schooners—Coastwise—dock here annually.	No water from bulkhead		—				
No boats dock here, ...							*Refiltered at plant.
Eight river coal barges dock here weekly.	Get no water here		—				*Refiltered at plant.
Sand, gravel and coal barges—river.	Get no water here		—				
No boats dock here, ...							
One river coal barge docks here weekly.	+	—	—			—	
One river coal barge docks here weekly.	Get no water here		—				*River water used for boilers.
One river coal barge docks here weekly.	Get no water here		—				
No boats dock here, ...							
Three river coal barges dock here weekly.	Get no water here		—				
One river coal barge docks here weekly.	Get no water here		—				

TABULATION OF THE USE OF WATER ON BULK-

BULKHEADS ALONG EAST BANK.

OCCUPANT OF BULKHEAD.	Number employed.	ON BULKHEADS.									
		City Water.			River Water.			Well or Spring Water.			Bottled.
		Drinking.	Fire.	Industrial.	Drinking.	Fire.	Industrial.	Drinking.	Fire.	Industrial.	Office.
American Ice and Coal Company,	23	+	+	—	None			None			—
P. Elmer Weitzel Brother and Sons, Lessee—Lumber Yard.	4	No water supply									
Baltimore and Ohio Railroad Company.	.....	+	—	—	—	+	—	None			—
Robert Patterson & Sons, Coal, Sand and Gravel.	35	+	+	—	None			None			—
John Lang Paper Company, ...	130	+	—	—	—	+	—	None			+
Ford & Kendig Co., Plumbing Supplies.	64	+	+	+	None			None			+
Knickerbocker Lime Company, ...	60	+	+	+	None			None			+
Penn Reduction Co., Lessee, ...	3	Get water from Bulkhead occupied by Knickerbocker Lime Company.									
Peoples Brothers, Lessee, ...	18	+				+	+	None			—
Conroy Coal Company, Lessee, ...	12	+				+	+	None			—
Phila. Electric Co., Station "G,"	20	+				+	+	None			—
H. D. Stratton Ice Company, ...	15	+		+		+		None			—
Thomas Lockhart Co., Dirt Wharf.	1	+			None			None			—

BULKHEADS ALONG WEST BANK.

Atlantic Refining Company, ...	(a)	+	—	—	(b)	+	+	None			—
Gulf Refining Company, ...	50	+	—	—	—	+	—	—	(a)	+	—
Penn Reduction Company, ...	170	+				+	+	None			—
John Maxwell & Sons, Lessee, Stone & Granite Works.	35	+	+	+	None			None			—
Franklin Smith, Lessee, Lumber Yard.	8	+	+	—	None			None			—
Haney & White Co., Lessee, Lumber Yard.	10	+	+	—	None			None			—
Pintsch Compressing Co., Lessee,	7	+	+	—	None			None			—
Charles Warner Co., Lessee, Sand, Gravel & Stone.	6	+	+	—	None			None			—

HEADS AND VESSELS:—SCHUYLKILL RIVER—Continued.

VESSELS. Coastwise. Transatlantic. River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Remarks.
Four river coal barges dock here weekly.	Get no water here —						
Three lumber schooners and three lumber barges dock here monthly.	—	—	—	—	—		
A police boat and a river launch dock here.	+	—	—	—	+		
Coal, sand and gravel barges dock here—river.	Get no water here						
One river coal barge docks here weekly.	Get no water here						
Three river coal barges dock here weekly.	Get no water here						
Five coal, sand, and gravel barges dock here weekly—river.	Get no water here						
Five garbage scows dock here—river.	Get no water here						
Coal, sand and gravel barges—river.	Get no water here						
One river coal barge docks here weekly.	Get no water here						
One river coal barge docks here weekly.	Get no water here						
One river coal barge docks here weekly.	Get no water here						
Two dirt scows dock here—river.	Get no water here						
See data given for bulkhead of Atlantic Refining Company on the east bank of the Schuylkill river.							(a) Population of two thousand given for bulkhead of Atlantic Refining Company on east bank of river includes employees at this bulkhead. (b) Water pumped by tug boats into mains in case of fire.
Three steamers and one barge dock here—coastwise.	Get no water here						(a) For boilers.
Five garbage barges dock here—river.	+	—	—	None		—	
Sand barges and schooners carrying stone and lumber dock here—coastwise.	Get no water here —						
Schooners and barges carrying lumber dock here—coastwise.	Get no water here —						
Schooners and barges carrying lumber dock here—coastwise.	Get no water here						
No boats dock here, ...							
Barges carrying sand, gravel and stone dock here—river.	None			+ (a)	—	—	(a) Barges obtain water from Delaware river at Florence, N. J.

TABULATION OF THE USE OF WATER ON BULK-

BULKHEADS ALONG WEST BANK.

OCCUPANT OF BULKHEAD.	Number employed.	ON BULKHEADS.									
		City Water.			River Water.			Well or Spring Water.			Bottled.
		Drinking.	Fire.	Industrial.	Drinking.	Fire.	Industrial.	Drinking.	Fire.	Industrial.	Office.
George B. Newton Coal Company.	24	+	+	+	None			None			—
Vermont Marble Company, ...	20	+	+	+	None			None			—
Stokes Brothers Co., Lessee, Lumber Yard.	8	+	+	—							
P. H. Fairlamb, Sand, Gravel and Stone.	15	+	+	—			+	None			—
George B. Newton Coal Company,	8	+	+	+	None			None			—
West Phila. Stock Yard Co., Lessee.	200	+	+	+	None			None			+
Penna. Railroad Pumping Station.	4	None					+ (a)	None			—
Henry Holt, Lessee, ...	6	+	+	—	None			None			—
Barber Asphalt Co., Lessee, ...	80	+	+	+	None			None			+
Atlantic Refining Company, ...	4	+	+	—	None			None			—
Mrs. J. J. Clancy, Lessee, ...	1	+	+	—	None			None			—
Joseph Burke, Lessee, ...	4	+	+	—	None			None			—
Bernard Connard, Lessee, ...	1	+	+	—	None			None			—
Peoples Brothers, Lessee, ...	20	+	+	—	None			None			—

HEADS AND VESSELS:—SCHUYLKILL RIVER—Continued.

VESSELS. Coastwise, Transatlantic, River.	ON VESSELS. City Water. Drinking.	City Water. Washing.	City Water. Boilers.	River Water. Drinking.	River Water. Washing.	River Water. Boilers.	Remarks.
River coal barges dock here, ...	+ (a)			+ (a)	—	—	(a) Barges obtain city water from piers on the Delaware river and river water from the Schuylkill canal above Reading, Pa.
River barges carrying sand and stone dock here.	None			+ (a)	—	—	a) Barges obtain water from Delaware river at Florence, N. J.
Coastwise schooners and brages dock here.	Get no water here					—	
River barges carrying sand, gravel and stone dock here.	None			+ (a)	—	—	(a) Barges obtain water from Delaware river at Florence, N. J.
River coal barges dock here, ...	+ (a)	—	—	+ (a)	—	—	(a) Barges obtain city water from piers on the Delaware river and river water from the Schuylkill canal above Reading, Pa.
No boats dock here, ...							
No boats dock here, ...							(a) River water is pumped into locomotive tanks.
Three tug boats and six manure barges dock here—river.	None			+ (a)	—	—	(a) Boats obtain water from Delaware river near Lincoln Park, N. J.
Barges carrying asphalt, sand and stone dock here—Coastwise and river.	+	—	—	+ (a)	—	—	(a) River barges obtain water from Delaware river at Florence, N. J.
River barges carrying oil dock here.	Get no water here						
River barges carrying manure dock here.	None			+ (a)		—	(a) Barges obtain water from Delaware river near Lincoln Park, N. J.
Two tugs and three barges carrying manure dock here—river.	None			+ (a)			(a) Barges obtain water from Delaware river near Lincoln Park, N. J.
River barges carrying manure dock here.	None			+ (a)		—	(a) Barges obtain water from Delaware river near Lincoln Park, N. J.
Four river barges, which carry dirt, ashes, and refuse, dock here.	+	—	—	None		—	

APPENDIX II.—REPORT OF AN INVESTIGATION OF THE USE OF BOTTLED WATERS IN PHILADELPHIA.

Coincident with the investigation made by the State Health Department of the typhoid fever epidemic in the fall of 1913, an investigation was also carried on by officers of the Department relative to the use of bottled waters in the city with a view to determining what relation such water supplies may have had to the epidemic. Examinations in detail were made of the establishments engaged in the bottling and distribution of spring and other water supplies, this including an inquiry at each place relative to the history of typhoid fever among the dealers, employees or their families. After the data collected by the various officers of the Department were in hand and had been studied most of the plants were revisited and verbal suggestions given for improvements in the handling of the water, and in several instances the suggestions were followed out. Practically all of the dealers interviewed appeared desirous of improving the sanitary conditions under which their product was prepared.

In the report which follows much of the detailed information respecting these various concerns is omitted, although it is in possession of the Department, and an attempt is here made to summarize the facts obtained and to offer certain suggestions, which if followed, it is believed will have the effect of rendering more safe the use of such water supplies.

The investigation conducted by the Department consisted of an inspection of the sources of supply, the methods of bottling and distribution together with the obtaining of samples of water for bacteriological analysis, both from the sources of supply and from the containers in which the water is delivered to the consumers. Generally, the investigation concerned the use of all bottled waters in the city and specifically covered in detail only the locally bottled drinking waters. For obvious reasons the investigations concerning bottled waters shipped into the city from remote sources did not include an inspection of the sources of supply or the methods of bottling as these waters are shipped from various points in the Union and also imported from foreign countries, but a list of such waters has been prepared. Also a list of the local bottlers of carbonated waters and soft drinks is included and in a few instances these plants were investigated by the Department.

There is quite an extensive trade in bottled water in Philadelphia. Much of this water is bottled in the city or within a short distance of it. Such supplies are mostly distributed by the person or concern who does the bottling. There is a large trade in such waters in office buildings, restaurants, hotels, railroad stations, and other buildings of a public or semi-public nature. In addition to the locally bottled waters a considerable quantity of such products shipped into the city is handled by the drug stores, both retail and wholesale, and by various department stores as well as by the larger hotels, but the use of such waters is small in comparison with the use of those locally bottled.

In Philadelphia at the present time there is in the strict sense of the word no licensing, of the bottled water business. It is understood by all peddlers that a permit must be obtained to distribute their goods throughout the city, but this does not constitute in any sense of the word, a regulation of the bottled water business. This permit is simply a receipt exchanged for the license fee. Venders of all kinds are taxed except the farmer who comes in from outside the city to sell his produce. He is not required to take out a license. In addition there is a mercantile appraisement and tax. The man who uses the Park Springs as a source of water to peddle must pay a tax of one dollar annually to the park commissioners. But all of these facts relate to some form of taxation and have nothing to do with the regulation of the bottled water business. No supervision thereof, whatsoever, is undertaken by any authority and there is no place of authority to which the Department was able to go and get the names of those engaged in this kind of business.

The sources from which the various supplies are obtained comprise wells, springs, and filtered surface supplies. There were found to be twenty-two persons or concerns principally engaged in bottling and distributing water in the city. In the case of thirteen of these the supply is obtained from springs, seven of which are located in Fairmount Park. Two dealers bottle water obtained from dug wells and seven dealers use a filtered surface supply, in each instance the supply being taken from a public water works system. Six of these seven dealers subject the water to a further treatment by refiltration, distillation, electrolysis, or ozonation. In the description of the various supplies which follows the water is designated as "still" water in distinction to that which is "carbonated." To the purchaser generally this bottled water represents a supply of water of a superior quality for which he is willing to pay.

In practically every case investigated the source of supply appears to be reasonably above suspicion, but in many cases there is danger of the product becoming contaminated in the bottling processes or through failure to sterilize the con-

tainers and stoppers before they are used again. When bottles are not capped opportunity is given for dust to collect around the corks in transit to the consumer and there is a possibility that the water may become contaminated in this manner.

At only six out of the twenty-two plants visited is any attempt made to sterilize the containers and stoppers before they are re-used. At three of these plants steam is used, at another a dry heat plant is in operation, at another the containers are boiled, and at one plant the bottles and corks are subjected to the action of ozone. At four plants the old corks are not re-used. At six plants all bottles are capped with paper immediately after being filled, and two of the dealers capped only the bottles which are supplied to the drug store trade.

In each of the plants bottles are corked by hand; at several this was apparently the only danger spot in the whole operation, the degree thereof depending largely upon the personal cleanliness of the operators. It is reported that experiments have been made by some of the more progressive dealers to eliminate this possibility, but no entirely satisfactory mechanism has yet been devised, consequently, the manual method of corking the bottles is still used.

Office stands for holding inverted bottles are supplied by dealers to customers desiring them. All of these stands operate on the same principle although there are three types varying slightly in construction. The principle of operation is as follows: The inverted bottle is supported by a circular shoulder forming the top of the water chamber which ends in a spigot at the lower end. The water chamber is surrounded by an annular space in which ice is placed and does not come in contact with the water. In the interior chamber the water rises until it is slightly above the mouth of the bottle thus sealing it from the entrance of air. As water is drawn off at the spigot the level in the chamber falls below the mouth of the bottle, and air is admitted to the latter so that water flows into the chamber and the level rises until equilibrum is again established. Thus as the water level continually rises and falls as the spigot is opened, the mouth and the lower part of inverted neck of the bottle are washed. Almost invariably the neck of a bottle is grasped in handling it and when caps are not used it follows that the dirt accumulating around the mouth of the bottle in transit and on the upper part of the neck from handling comes in contact with the water in an office stand. In none of the samples from office stands, was the presence of B. Coli noted and in many cases these samples showed a lower total count than those taken from filled bottles. Possibly this was due to a lower temperature of the water in the ice jacketed stands.

In only four of the samples taken from office supplies was the presence of B. Coli noted. Three of these gave a count of one each and the fourth contained 400 B. Coli in one cubic centimeter. The latter sample was secured from a partly empty bottle which had evidently been standing in a dusty hallway for some time and had probably become contaminated after it had reached its destination and been repeatedly opened as it became necessary to pour water into the ice cooler. During this operation probably the cork was held in the hand which tilted the bottle, while the other grasped the neck. Considerable likelihood of contamination could exist in this procedure which had probably been repeated before the sample was taken.

In the following table is given a list of the principal bottlers and distributors of bottled water supplies in the city. They are twenty-two in number and the supplies include springs, dug wells, and filtered surface waters.

PRINCIPAL BOTTLERS AND DISTRIBUTORS OF LOCAL BOTTLED WATERS.

Name and Place of Business.	Source of Supply.
1. Bell Telephone Co. of Pa., ...	City Water refiltered.
2. Clear Spring Water, 6007 N. Randolph St.	Fountain Green Spring, East Fairmount Park.
3. Colonial Springs Water Co., 2000 Market Street.	Spring near Valley Forge, Schuylkill Township, Chester County.
4. Crystal Spring Water, 947 N 12th Street.	Arrow Spring, East Fairmount Park.
5. Delco Spring Water, Upper Darby Township, Delaware County.	A spring on the premises.
6. Eureka Water, 2230 N. 15th street.	Belmont Spring, West Fairmount Park
7. Excelsior Spring Water, 534 Martin Street, Roxborough.	Spring in Lower Roxborough.
8. Fairholme Crystal Springs Water Co., 1904 Walnut Street.	Dug well near Winonah, New Jersey.
9. Famous Rock Spring Water, Hagy Street, Upper Roxborough.	Dug well at bottling house.
10. Great Bear Springs Co., South 31st & Chestnut Streets.	Springs, Oswego County, New York.
11. Hillcrest Spring Table Water, South 20th & Spruce Streets.	Spring near Valley Forge

12. Indian Rock Spring Water, 508 Monastery Avenue, Roxborough.	City Line Spring, West Fairmount Park.
13. Laurel Spring Water, 2650 Myrtlewood Street.	City Line Spring, West Fairmount Park.
14. Northridge Spring Water, 4000 Chestnut Street.	Spring-Tredyffrin Township, Chester County, near Malvern.
15. Purity Spring Water, 625 Dupont Street, Roxborough.	City Line Spring, West Fairmount Park.
16. Purock Water Company, North 12th & Parish Streets.	City water, distilled and filtered.
17. Rose Glen Spring Water, 437 W. Martin Street, Roxborough.	Arrow Spring, East Fairmount Park.
18. Silox Pure Water Co., 3015 Chestnut Street.	City water refiltered and ozonated.
19. Springfield Bottled Water Supply Co., 5740 Race Street.	Springfield water at Lancaster Avenue and City Line.
20. Springfield Water Supply Company, 621 N. 54th Street.	Springfield Water Company at Wynnewood pumping station, Lower Merion Township, Montgomery County.
21. Standard Ice Manufacturing Company, 2700 South Street.	City water, electrolysis and pressure filter.
22. Sunbeam Water Co., Inc., 1937 Market Street.	City water, refiltered and distilled. Also Excelsior spring water, called Crystal Rock spring water.

The Bell Telephone Company, the Purock Water Company, and Silox Pure Water Company, the Standard Ice Manufacturing Company, and the Sunbeam Water Company obtained all or part of their supplies from the city of Philadelphia water works system. This city water is subjected to treatment. The Bell Telephone Company refilters and furnished this water to six of its exchanges to employees only; the Purock Water Company and the Sunbeam Water Company refilter the water and distill it; the Silox Pure Water Company refilters and ozonates the supply; and the Standard Ice Manufacturing Company refilters and then treats the water electrically.

Two of the dealers take their supply from the Springfield Consolidated water works system. The Springfield Bottled Water Supply Company gets the water at a point near the Delaware County Line, probably filtered Crum Creek water. It is refiltered in a charcoal filter at the company's place of business. The Springfield Water Supply Company draws the water from the public system of the Springfield system near Ardmore and does not subject the water to any further treatment.

Fifty-three samples of water were collected from the products of these seven companies and were analyzed by the Department, but no B. Coli were found. The seven companies have eleven thousand three hundred and thirty customers using these waters. The Purock Water Company is the largest dealer, having four thousand customers. The Bell Telephone Company is extending its system of supplying pure water to all its buildings and before long many thousand employees will be served with refiltered city water. Pertinent facts relative to the bottling and handling of these public supplies are shown in the following table:

TABLE SHOWING FACTS RELATIVE TO BOTTLING AND HANDLING OF FILTERED SURFACE SUPPLIES.

Dealer	Bottling and Handling.
1.	Bottling done in the engine room. Supply from the Philadelphia city mains. Refiltered in pressure filters which are cleaned at frequent intervals. Two and five gallon bottles used. Washed in hot water and rinsed in cold re-filtered water. Cork stoppers reused and not washed. No caps nor labels used. Supplied to employees in Exchange Buildings only. Number about three thousand. Ice coolers are placed in different rooms. Bottles do not leave premises.
16.	Philadelphia city water used—distilled. Bottles are washed in cold water and soda and then sterilized for ten minutes in live steam. Corks are not reused. Bottles are kept sealed and labeled. Company is planning to use glass stoppers only. Water distributed in city and suburbs. Weekly consumption about twenty-four thousand gallons. In Philadelphia supplies about four thousand customers. Fifteen employees at plant. Modern toilet facilities provided apart from bottling room. It was reported that water is not stored at the plant longer than forty-eight hours.

TABLE SHOWING FACTS RELATIVE TO BOTTLING AND HANDLING OF FILTERED SURFACE SUPPLIES—Continued.

Dealer.	Bottling and Handling.
18.	Philadelphia city water used. Refiltered in pressure filter and ozonated. Bottles washed with cold city water and soda and rinsed with refiltered ozonated water. Corks are reused, washed, and tin foil is placed about each cork. Bottles are capped, sealed and re-labeled. The company is planning to install modern bottling apparatus and dry heat sterilizers. Weekly output two thousand gallons, distributed to two hundred customers. Ten employees at plant. Modern toilet facilities provided.
19.	Supply obtained from the mains of the Springfield Consolidated Water Company through a fire plug located at Lancaster Avenue and city line and hauled to the bottling plant in a steel tank wagon. Here re-filtered. Bottles washed with cold Philadelphia city water and soda and rinsed with hot city water. Corks are reused but not washed. The bottles are labeled but not capped nor sealed. The bottles are filled from storage tanks through a hose in the wagons outside the plant. Supplies two thousand customers with ten thousand gallons of water weekly. Twenty hands are employed and modern toilet facilities are provided apart from the plant.
20.	Supply obtained at the Wynnewood pumping station of Springfield Consolidated Water Company. Bottles filled at pumping station. Are washed with cold city water and soda in wagon-shed adjoining the company's stable. Are rinsed with hot water, corked and conveyed by wagon to pumping station. Corks are washed and reused. Bottles are not capped nor labeled. Tin-foil, reused without washing, wrapped about cork. Eighteen hundred gallons of water supplied weekly to eight hundred customers in city and suburbs. Sometimes six days intervene between washing and filling the bottles and the water is stored at times in the stable for two or three days without being distributed. When inspected there were seven horses in the stable and the presence of customary refuse was noted. Four men are employed to bottle and distribute this supply.
21.	The principal business of this firm is the manufacture of ice, bottled water business being a side issue. Philadelphia city water is the supply, passed through an electrolysis machine thence through pressure filters. Bottled in one and five gallon containers, the former having glass stoppers and the latter cork stoppers. Corks reused after washing with cold water. Bottles washed with cold city water and soda, but not sterilized. Are labeled but not capped. About two thousand gallons of water sold weekly in the city to thirty-two customers. Three employees at plant.
*22.	Supply is city water re-filtered in sand pressure filter, distilled, then passed through a charcoal pressure filter and thence through a disc paper filter. Bottles are washed with cold city water and soda, rinsed with hot city water, sterilized with live steam and closed with cork stoppers wrapped in tinfoil. Stoppers are bleached and sterilized before being used. The bottles are labeled and those supplied to drug stores are capped, this trade amounting to about three thousand gallons weekly. The entire weekly output of the plant amounts to about six thousand gallons, distributed to about twelve hundred customers in the city and suburbs.

*About fifty gallons a week of Excelsior Spring Water (No. 7) purchased in five gallon bottles is transferred at the plant to half gallon glass stoppered bottles and sold under the name of Crystal Rock Spring Water. This is a spring supply filtered in charcoal filtered, more fully described under the head of Excelsior Spring Water.

There are seven men licensed and engaged in the business of collecting water from four springs, located in East and West Fairmount Park, bottling and distributing it to the public. In West Fairmount Park are the Belmont Spring and the City Line Spring. From this latter spring three persons are licensed to take water and from the Belmont Spring one dealer secures his supply. In East Fairmount Park are located the Arrow Spring and the Fountain Green Spring. Three persons are licensed to take this water, one from the Fountain Green Spring, and two from the Arrow Spring.

The Fountain Green Spring is properly protected and has an overflow pipe at which dealers fill the bottles. The Arrow Spring itself is properly protected, but the water is piped to a basin to which the public have access for dipping water and an overflow pipe from this basin delivers the water that is bottled. The City Line Spring is protected, the water being piped to a basin from which the public dip. The bottlers obtain their supply from this spring through a removable extension pipe that can be fitted on the influent pipe supplying the basin. When not in use this extension pipe lies on the ground. The Belmont Spring is otherwise known as the Lafayette Spring. It is properly protected and the bottles are filled at a pipe which delivers the water from the spring to a fountain.

In the following tabulated form are shown the principal data respecting the collection and distribution of waters from these Park Springs:

TABLE SHOWING FACTS RELATIVE TO THE COLLECTION AND DISTRIBUTION OF BOTTLED WATERS OBTAINED FROM FAIRMOUNT PARK SPRINGS.

Dealer.	Bottling and Handling.
2.	Supply from Fountain Green Spring. An individual dealer having one wagon supplying one hundred and fifty customers with about three hundred gallons of water weekly. Generally, the one and five gallon containers are merely rinsed at spring before being filled. When exceptionally dirty they are washed at dealer's home with hot water and soda in a wash tub presumably also used for laundry purposes. At time of inspection the sanitary conditions at home were not good. Empty bottles are stored in a carriage-house adjoining stable at dealer's home. Bottles are filled direct from the overflow pipe at spring. The cork stoppers are re-used, but they are soaked in a solution of oxalic acid. The bottles are not capped nor sealed nor labeled. The product is known as Clear Spring Water and is distributed in the district lying east of Broad Street between Market Street and Lehigh Avenue.
4.	One dealer is here engaged. Supply obtained from the Arrow Spring product being known as Crystal Spring water, but the bottles are not labeled. Bottles are filled from an overflow pipe from small basin to which the public has access ,two dippers being provided for such use. Usually the empty bottles are rinsed at spring before being filled. Those that are noticeably dirty are washed at the home of the dealer with hot city water and soda in a trough reported to be used for this purpose only. Quart, gallon, and five gallon containers are used. With the latter two sizes of cork stoppers are provided, the quart containers have porcelain stoppers with spring tops. It is believed that the cork stoppers are re-used. The bottles are not capped. Empty bottles uncorked were stored in a horse stable at the dealer's home when the investigation was made. The dealer declined to state the amount of water distributed or the number of consumers served.
6.	Individual dealer with one wagon supplying about three hundred gallons weekly to one hundred customers. Supply comes from the Belmont Spring. The containers are washed at the spring prior to filling. Cork stoppers are re-used without being washed. The bottles are capped as soon as filled. The supply is sold under the name of Eureka Water. The bottled water is at times stored for several days in an empty stable and empty and filled bottles are also at times left over night in the delivery wagon at a livery stable.
12.	An individual dealer distributing about one thousand gallons weekly to three hundred and fifty customers over seven routes. Supply from City Line Spring. Bottles filled through a detachable pipe which lies on the ground when not in use. Containers are washed at spring just prior to filling, no washing preparation being used. Cork stoppers are re-used first being washed in a solution of oxalic acid. Around the cork is placed tinfoil. The five gallon containers, but not the one gallon containers, are capped. Empty containers are kept in wagons in a closed shed adjoining the stable, but separated therefrom by sliding doors. No water is stored here.
15.	An individual dealer, with a supply from City Line Spring as above. About four hundred gallons are sold weekly to one hundred and twenty-five customers on four routes throughout the city. Usually the containers are washed at spring just prior to being filled. Other dirty bottles are washed in hot water in tub, said to be used for this purpose only, at dealer's home. Corks are re-used first being scalded with boiling water. Bottles are not capped. Empty containers stored in open shed at rear of dealer's dwelling and also in wagon-shed adjoining stable.
17.	An individual dealer supplying Rose Glen Spring Water. Supply is obtained from Arrow Spring. Bottled water business is a side issue to dealer's butter and egg business. About thirty gallons weekly sold to sixteen customers on one route in northwest section of West Philadelphia. Bottles filled at spring from overflow pipe of basin from which public may dip water, dippers being provided. Containers are washed at spring just prior to being filled. Galvanized iron tub is provided for this purpose and a soda washing preparation is used. Cork stoppers are re-used after being washed. Bottles are not capped. Empty containers are stored in cellar of dwelling along with old barrels and rubbish of various kinds.

In addition to the dealers of bottled water obtained from the Park Springs there are also six other persons or concerns engaged in supplying spring water in Philadelphia, one obtaining a supply in the city, three in Chester County, one in Delaware County, and one in New York State. The data collected concerning these supplies are shown in a summarized form in the following table:

TABLE SHOWING DATA RELATIVE TO BOTTLED SPRING WATERS DISTRIBUTED IN PHILADELPHIA FROM SOURCES NEAR BY BUT OTHER THAN PARK SPRINGS.

Dealer.	Bottling and Handling.

3. This supply is bottled and distributed by the Colonial Springs Water Company operating three covered wagons on eighteen routes and supplying about three thousand gallons weekly to twelve hundred customers in Philadelphia. The water is shipped by rail to Norristown, Phoenixville, and Philadelphia. The water is supplied under special service to the Pennsylvania Railroad for restaurant and dining cars and is analyzed weekly. The spring is in Schuylkill Township, Chester County, near Valley Forge, and is apparently well protected against contamination. The water is bottled directly from the spring, no storage being provided. Two men are employed at the bottling plant and modern toilet facilities are provided apart from this building.

The containers are washed with cold spring water and a soda washing preparation, "hydro brushes" being used. They are rinsed with hot water and then sterilized with steam. Cork stoppers are re-used, first being washed with spring water and sterilized for two hours. Bottles are filled immediately after cooling, being placed on benches beneath the glass siphon tubes leading from the spring, and are then corked and capped. The maximum time that water is stored is six days.

5. An individual dealer supplying about one thousand gallons of water weekly to ninety customers in the central part of Philadelphia. The supply is called Delco Spring Water. The supply is from a spring on a farm leased by the dealer in Upper Darby Township, Delaware County. The spring is protected and enclosed in a house, the water being used for no other purpose. The bottles are filled from an overflow pipe from the spring. Usually the containers are washed in cold spring water, but when noticeably dirty hot water and a brush are used to clean them. Cork stoppers are re-used after being washed in cold spring water and no caps are provided nor are the bottles labeled. The bottling room is adjacent to the spring and adjoining it is a shed where the horse and delivery wagon are allowed to stand. Near the spring-house is another spring that is reported as having at one time been used, but is now abandoned. This is unprotected.

7. An individual dealer. Supply comes from a spring in Lower Roxborough, Philadelphia, near the Lower Roxborough water filtration plant. Dealer has two auto-trucks, twelve routes, and supplies about forty-two hundred gallons of water weekly to nine hundred customers. Water is sold under four different names:—as Excelsior Spring Water, delivered mostly to individual customers; as Roxborough Pure Spring water, supplied to retail drug stores; as Lenape Spring Water, furnished to a retail grocer; as Crystal Rock Spring Water and sold in small quantities to the Sun Beam Water Company (No. 22). The spring is enclosed by a masonry structure and the water is lifted by a ram to the bottling house, here passing through a charcoal filter to a tank from which it is delivered to the bottles through self closing filling faucets. It is reported that the charcoal is removed from the filter at frequent intervals and washed, steamed, and dried. Two men are employed at the plant. No toilet facilities are provided.

Empty bottles are washed in a trough with spring water and washing soda into which steam at sixty pounds pressure is introduced. After being thus boiled the bottles are rinsed in spring water and immediately filled, then corked and most of the bottles capped. Corks are not re-used.

10. A branch of the company operating six distributing plants located in New York, New Jersey, and Pennsylvania. The first plant was established about twenty years ago and has been in continuous operation since then. The Philadelphia plant was put into operation in 1897. The supply is from two springs located in Oswego County, New York. From here water is conveyed to the various distributing plants in the company's porcelain lined tank cars of eight to ten thousand gallons capacity. In Philadelphia, tank cars are placed on a siding adjacent to the plant and pumped from the cars to storage tanks through a flexible steel hose, the ends of which, when it is not in use, are protected by cloth coverings. The storage tanks are scrubbed and sterilized with steam monthly. From the tanks water is conveyed to two filling machines and once every twenty-four hours steam at thirty pounds pressure is introduced for one-half hour into the pipe line and discharge nozzles connected with these machines.

The empty containers are washed with city water and soda, rinsed with boiled city water and on galvanized iron trays placed in a dry heat plant remaining there for half an hour with the temperature varying from two hundred and ten to two hundred and thirty degrees Fahrenheit. When the bottles have cooled they are placed in wooden cases or crates and are filled, stoppered, and capped, care being taken to prevent the operators' hands from touching the mouths of the containers. Glass stoppers are used for the five pint bottles and corks for the two and five gallon bottles. The glass stoppers go through the same sterilization process as the containers. Cork stoppers are not re-used and the new corks are sterilized in the dry heat plant. The longest period that water remains in the storage tank is said to be about a week and the water is delivered to consumers within forty-eight hours after the bottles are filled. There are nine employees at the plant. They are obliged to wear a prescribed uniform. Modern toilet facilities are provided apart from the bottling room.

Approximately seventeen thousand five hundred gallons of this water are distributed weekly by wagons over forty-seven routes in the city and suburbs, supplying seven thousand customers. The company employs a bacteriologist in New York City who makes weekly analyses of the water from the various plants. All bottles are capped, sealed, and labeled.

TABLE SHOWING DATA RELATIVE TO BOTTLED SPRING WATERS DISTRIBUTED IN PHILADELPHIA FROM SOURCES NEAR BY BUT OTHER THAN PARK SPRINGS—Continued.

Dealer.	Bottling and Handling.
11.	An individual dealer. Supply is known as Hillcrest Spring Table Water. The proprietor of the business is a druggist from whose establishment in Philadelphia the water is distributed, about five hundred gallons of this supply being served weekly to seventy customers in the central part of the city, and supplied to residences only. The supply is from a spring located in Tredyffrin Township, Chester County. The spring is protected and the bottles are filled at an overflow pipe therefrom. The containers are rinsed in cold spring water just before being filled. Cork stoppers are washed in cold spring water and re-used. The bottles are not kept at the spring but at the dealer's drug store in Philadelphia to which point the filled bottles are conveyed by wagon. The labels are also put on at the drug store in the city.
14.	An individual dealer who has a drug store in Philadelphia which serves as a distributing point for the bottled water hauled by wagon from the spring, from which the supply is obtained, located in Tredyffrin Township, Chester County, four and one-half miles north of the Malvern Station of the Pennsylvania Railroad. The spring is protected, an overflow pipe being provided at which the bottles are filled. The containers are rinsed with water at the spring before being filled and then bottled and capped, this last practice being followed only since the Department's inspection. These are five gallon containers. In the cellar beneath the drug store some of this water is transferred to one gallon containers which are washed with cold city water and rinsed with spring water before being filled. This bottled water is stored for a maximum period of about three weeks. Approximately three hundred gallons of this supply are distributed weekly to two hundred customers throughout the city.

Bottled water obtained from dug wells is supplied in the city by one company and one individual. The principal facts regarding this supply are set forth in the following tabulted form.

TABLE SHOWING DATA RELATIVE TO BOTTLED WATERS OBTAINED FROM DUG WELLS.

Dealer	Bottling and Handling.
8.	Bottling plant and source of supply are located in Gloucester County, New Jersey. The supply comes from a sixty foot dug well lined with a dry brick wall. The top is surrounded by a concrete platform, but the cover over the well is of plank construction. Water is raised by a hand pump. The covering is not tight. The well is near the rear of the farm house on the property. Within six feet of the well a sewer pipe passes which receives kitchen drainage, wash water, and sewage from the dwelling. In the spring of 1913 the well was dry and the water supply was obtained from a spring not properly protected. At this time the containers were filled at a platform by dipping from the spring. All containers are washed in cold well water. Sand or pebbles are used for scouring when the bottoms are noticeably dirty. This washing is done in a shed next to the kitchen where all the work of the farm house is performed. The bottles are filled directly from the pump and immediately corked, but are not capped. The cork stoppers are not reused. The bottles are labeled and the water is distibuted by wagon in Woodbury and Gloucester, New Jersey, and Philadelphia, where most of it is supplied to business offices. There are about fifty customers in Philadelphia who use three hundred gallons of water weekly.
9.	An individual dealer. Supplies about three hundred gallons of water weekly to one hundred and twenty-five customers in Philadelphia, water being known as Famous Rock Spring Water. The supply is from a dug well on Hagy Street in Upper Roxborough. The well is thirty feet deep, lined with loose stone and over it is the bottling house. Containers, one gallon in size, are washed in a tub containing warm well water and a soda washing powder immediately after which they are filled. The water is dipped from a tub with a pitcher and poured into the bottle through a funnel having a cloth over the top. It is reported that these tubs are not used for any other purpose. Immediately after filling the bottles are corked, but not capped. The corks are not re-used. Empty containers are stored in the cellar of the dealer's dwelling near by and kept corked. This supply is distributed mainly in the Germantown, Tioga, and North Philadelphia sections of the city.

OTHER BOTTLED WATERS AND THE LIKE.

In addition to the bottled waters already described in this report, there is a very considerable sale of bottled water brought in from other states or from abroad, even from Japan. Some of these waters are known to have medicinal qualities and are in demand on that account. Others are desired for use as table waters and are sold in great quantities. Probably fifty, certainly well over forty different brands of bottled carbonated or still water from outside are distributed in Philadelphia, largely by druggists and grocers. Another large number of bottlers, at least eighty-five, are engaged in preparing and bottling various kinds of "soft drinks" and carbonated waters, such as the so called "soda water" in bottles or siphons. The Department gathered some data as to these distributors and bottlers, but undertook at this time no extended investigation.

CONCLUSIONS AND RECOMMENDATIONS.

From the inspection summarized above certain conclusions relative to the bottled water business in Philadelphia may be drawn and recommendations offered looking to the correction of methods employed in this business. The business of bottling spring and mineral waters and distributing them to the public in Philadelphia should be regulated and licensed. This necessarily will require constant supervision in that city entailing the employment of a force to carry on this work and will be accompanied by certain incidental expenses.

Attention should be bestowed on the purity of the water to be used. This involves protection from pollution of the source of supply where the source is a spring or well. Where the source is a public water supply the question arises as to the purity of this supply including the matter of re-filtration. Furthermore, where the water is hauled or transported to the place of bottling, great care should be maintained to keep the water pure in transit and in storage pending bottling. It is often better to have the bottling done at the source of supply where this is possible, but it is not absolutely necessary and in fact from some of the investigations made, it appears that bottling at the springs under the conditions obtaining, may be attended by more or less danger of contamination. Frequent bacteriological analyses of the water are necessary as a check on the other precautions to preserve the purity of the water. Samples of the water at the place of bottling and also from the bottles on the wagon and in offices should be collected at frequent intervals for analysis.

Equally requisite are clean and sterile containers, stoppers, and utensils for handling the water. All containers of the pure water and stoppers should be sterilized immediately before filling and upon filling the stoppers should be capped and sealed and the bottles labeled. This should be done preferably at the place where the bottles are filled. Where the source is a spring in Fairmount Park it is not practicable to sterilize the bottles there. In such case either the source should be abandoned or extreme care should be used in capping the bottles where they are sterilized and also extreme care should be taken in uncapping the bottles preparatory to their being filled at the spring. As an alternative water in bulk might be secured and transported to the place of bottling. If this is done the tank wagon or a large container and all apparatus used in getting the water into the tank and from the tank into the bottles should be kept clean and sterile, which would mean additional risk and additional precautions, all of which point to the ultimate abandonment of the Park Springs as sources of supply for bottled water.

Possibly the next thing in order of importance is to have the place in which the business is conducted in a perfectly clean condition and suitable for the purpose. Bottling in sheds, stables or basements or other places not well lighted and not devoted exclusively to the bottling and handling of water, ought to be discontinued. The room and all apparatus and furnishings should be kept spotlessly clean and should be located away from dirty surroundings. This means a radical change in a number of instances.

A thing of vital importance is the health and cleanliness of the employees. Anyone who is negligent in personal hygiene should not be permitted to conduct or work in a bottling establishment, deliver water or engage in the business in any capacity. Proper toilet facilities should be afforded and proper habiliments should be worn and strict rules should be enforced regulating the conduct of those engaged in the business in any capacity.

The proper labeling of the water containers delivered to the consumers is important. All containers should be capped, sealed, and labeled. Preferably all bottles should have the name of the water molded in. This would do away with the pasting of labels on the bottles and the washing off of them each time the container is cleaned and sterilized. Furthermore, there should be no interchange of bottles between different dealers. Where the name is molded in, this interchange is not so likely to occur.

The water after being delivered in offices and public places may become contaminated through carelessness on the part of the users of the water or neglect to keep the stand and water coolers clean. The dealer might well see to it that printed precautionary instructions are placed in a conspicuous position at such water coolers. Of course, the use of the common drinking cup should not be tolerated.

And, finally, why should any city which provides a public water supply compel its citizens and the sojourners within its gates to resort to bottled waters?

25. TYPHOID FEVER AT PHILADELPHIA, ATTRIBUTED TO INFECTION BY WATER CRESS.

This interesting instance of an extensive infection with typhoid fever, probably through water cress, was speedily made known by means of the newspapers and other publications. The earlier reports failed to show any previous history of typhoid fever connected with the water cress, the farm where it was grown, or the source of water supply for the cress beds. Further investigation presently revealed that the cress in question, instead of coming from the farm originally reported, may have come from either of two other farms which supplied the retail dealer, and on one of which conditions were found that might readily explain the typhoid. This was a conspicuous isolated outbreak during the undue prevalence of the disease in and around Philadelphia, which at the time was receiving the attention of both State and City authorities. The following is a brief statement of the outbreak and of the measures taken by this Department relative to the water-cress beds.

The Outbreak.

Eighteen cases of typhoid fever developed among the forty-three guests at a fashionable wedding breakfast in Philadelphia on June 24th, 1913. The onsets occurred from July 7th to 12th. Only nineteen of the guests (the eighteen who developed typhoid, and one other) ate water-cress at the breakfast. This fact pointed to the water-cress as the likely cause of the outbreak. No other clue was afforded by the study made by the Philadelphia health authorities of the menu at the breakfast and reports obtained from the guests of the foods eaten, nor was knowledge obtained of any recent case of typhoid or "typhoid carrier" among those who had handled the cress and prepared it for the wedding breakfast.

The guests separated within a few days to summer resorts, some as far distant as the State of Maine, and it was only at the close of July that the significant circumstances attending these cases of typhoid fever could be analyzed, with complete data available, by the Philadelphia health authorities.

Water Cress Farm in Marple Township, Delaware County.

The State Department of Health was advised on July 30th of the suspicious circumstances indicating this typhoid infection to have come, very likely, from the water-cress, which was reported to have been brought from a farm (operated for water-cress and leased by Louis Muehlmatt and James A. Mullen) near the Lamb Tavern, in Marple Township, Delaware County. The following day an investigation of this water-cress farm was made by the Department's County Medical Inspector, Dr. Joseph Scattergood. The farmstead privy was found to be six feet from the little stream watering the long basin in which the cress was grown and close to the head of the cress bed itself. There was also some danger of pollution of the cress bed from the manure on immediately adjacent truck patches. The discontinuance of the marketing of the cress and the removal of the privy to a proper location were ordered as well as such other measures as were necessary to make the supply of cress entirely satisfactory. Subsequent inspections were made to see that these orders were complied with.

No history of typhoid could be discovered attaching to the farm or employees. The only manure used had been produced on this farm. The chain of evidence as to the cause of the outbreak was incomplete. The water of the cress bed, however, as shown by analysis, was grossly polluted with intestinal organisms and a potential source of disease infection should pathogenic germs have found their way into the bed with the ordinary sewage pollution.

Other Water-Cress Farms.

Continued interest in the matter led to the discovery that the retailer of the water-cress in question bought from two other persons but had at first named the farm above mentioned, thinking it to be the best appearing and perhaps not appreciating the possible consequences of not disclosing all his sources. One of these other farms was within Philadelphia and investigated by the local authorities and reported to be satisfactory.

The State Department of Health was advised of the third source, a water-cress bed near Paoli. The Department's Medical Inspector was directed to make an investigation and found two farms. One (that of Mrs. F. S.) is in Tredyffrin Township, Chester County, near Paoli, and on this farm the conditions were dangerous, as will be shown. The second farm (that of a son-in-law of the above) is in East Whiteland Township, Chester County. The conditions here were satisfactory.

Water Cress Farm in Tredyffrin Township, Chester County.

From the farm in Tredyffrin Township, Chester County, as many as a thousand bunches of water-cress daily are shipped, the largest shipments being in the winter and spring when the demand is greatest. There are both summer beds and winter beds, the former being the ones which were in dangerous condition. The winter beds, five in number, are parallel basins from 350 to 500 feet long, each fifteen feet wide and separated by barriers of about the same width. These beds are enclosed. They are fed entirely by the water from two springs located, one at the end of one of the beds and one between the beds, and by a number of smaller springs within the beds. These beds were found in satisfactory condition from a sanitary point of view.

The summer beds were fed with water from Valley Creek. A low concrete breast seventy-five feet long had been constructed across the creek forming a shallow basin. From the lower side of this breast extend the cress beds, five in number, from fifteen to eighteen feet wide and 350 feet long. They are separated by barriers two feet wide and the low banks are walled up with timbers. The water is fed to the beds through openings in the concrete breast and flows out of the beds at the lower ends and back into Valley Creek, the main stream of which overflows from the basin and passes around the beds to the south. It was customary to wash the water-cress before shipping but, of course, not in a manner to remove all the pollution which might adhere to the cress from the water in which it was grown.

Eight typhoid cases occurred within the drainage area of Valley Creek above the water-cress farm during 1912. Six of these cases occurred from half a mile to a mile from the cress beds in the village of Cedar Hollow. A tributary of Valley Creek flows through the settlement and close to the banks of the stream reside upward of one hundred families of foreign laborers employed at the extensive limestone quarries and lime burning plants here located. The main stream of Valley Creek rises six miles above the water-cress farm and flows through a populous fertile valley and through the foreign labor settlement at Knickerbocker, where other lime quarries are located. Sanitary inspectors of the Department have covered this drainage area carefully from time to time and practically all pollutions have been abated. Nevertheless, any who have had to do with the floating foreign labor classes will fully appreciate how thoroughly impracticable it is in such cases to obtain entirely satisfactory permanent abatements of pollutions.

Extensive sewage pollution from these foreign settlements undoubtedly reached Valley Creek and the cress beds. Many of the foreigners have been known to wash their clothing directly in the creek. Kitchen and laundry wastes very likely have reached the creek from two of the properties which harbored typhoid cases in 1912. It seems very reasonable to suppose that typhoid fever infection originating from some one of these cases may have been the source of infection of the water-cress nearly a year later. This is quite consistent with our knowledge of the endurance and persistence of typhoid fever germs.

The distribution of the water-cress from the farm was prohibited as soon as the polluted condition of the summer beds became known and shipments were not again allowed until September 10th, when the unpolluted winter beds came into bearing and the growth of cress in the summer beds had been destroyed. Afterwards, under the direction of the Department's County Medical Inspector, these beds were disconnected from the creek water supply, cleaned and limed.

The following are the results of bacteriological analyses of samples of water collected from the water-cress beds on this farm by Inspector W. W. Ritter, of the State Department of Health, and analyzed at the Department's laboratories. These results show the very extensive pollution of the summer beds and the stream supply, and also the absence of sewage contamination of the springs feeding the winter beds.

Samples collected and received at laboratory August 19, 1913.

	Bacteria per c.c.	B. Coli per c.c.
1. Stream in Cedar Hollow,	5,400	10
2. Stream inlet to basin above summer beds,	21,500	20
3. Inlet from basin to summer beds,	50,000	45
4. Outlet from summer beds to stream,	28,000	150
5. Mud from summer bed No. 1	500,000	225
6. Spring No. 1 feeding winter beds,	200	0
7. Spring No. 2 feeding winter beds,	60	0

The above samples were collected when the stream was high and turbid, due to showers of the preceding day.

Samples collected and received at Laboratory August 21, 1913.

	Bacteria per c.c.	B. Coli per c.c.
1. Stream inlet to basin above summer beds,.....	4,500	16
2. Inlet from basin to summer beds,.....	3,000	12
3. Outlet from summer beds to stream,.....	4,800	10
4. Mud from summer bed No. 1,.....	200,000	0
5. Spring No. 1 feeding winter beds,.....	120	0
6. Spring No. 2 feeding winter beds,.....	40	1
7. Tap at farmhouse,.....	5	0

The stream was practically normal when the foregoing samples were collected. It is reasonable to assume under the conditions as they existed that the showing of one Colon Bacillus per cubic centimeter in the sample from Spring No. 2 was due to accidental pollution in the spring enclosure at that time and not to any more serious cause.

Before any additional samples were collected, the creek supply had been shut off from the summer beds and they were being watered from another spring designated as Spring No. 3. The beds and spring had not been permanently protected, however, and no cress was being shipped from the farm at this time.

Samples collected and received at Laboratory September 2, 1913.

	Bacteria per c.c.	B. Coli per c.c
1. Stream inlet to basin above summer beds,.....	1,800	30
2. Overflow from basin above summer beds,.....	1,750	15
3. Spring No. 3 feeding summer beds,.....	1,200	4
4. Outlet from summer beds.....	21,500	15
5. Spring No. 1 feeding winter beds,.....	21	0
6. Spring No. 2 feeding winter beds,.....	320	0
7. Outlet from winter bed No. 1,.....	10	0
8. Outlet from winter bed No. 5,.....	23	0

The sewage polluted condition of the stream watering the cress beds was the circumstances menacing the public health. The occurrence of Colon Bacilli might be looked for in the samples from the outflow and from the mud in the beds since some stable manure is used in planting, and there is more or less wading by the men in cutting the cress.

Conclusions.

The trail of typhoid fever infection leads from Cedar Hollow, where the last known cases had their onsets in September, 1912, through the agency of the sewage polluted stream to the water-cress beds on the farm in Tredyffrin Township, Chester County, and thence to the wedding guests in Philadelphia, and probably to other cases scattered so widely as to be effectively concealed. It is not so sharply defined as to be absolutely conclusive, yet it is a quite plausible and very likely explanation.

The indisputable fact, it seems, is that the water-cress sandwiches, however infected, were the medium of the spread of the typhoid at the wedding breakfast. Seldom can such conclusive evidence be obtained to emphasize so clearly the need of adequate measures to insure the thorough cleansing of vegetables which are to be eaten without being cooked, that is sterilized by heat.

Vegetables eaten raw have long been recognized as possible carriers of water borne disease infection. Yet instances of such infection are seldom determined because the cases are usually widely scattered as to the location and the dates of the onsets are not so nearly coincident as in epidemics resulting from the distribution of infection in water or milk simultaneously throughout a sharply defined district. Nevertheless, the scattered cases of typhoid fever of undetermined origin rather than those occurring in the big epidemics comprise the majority of the total number of cases when reckoned through long periods and over extended territory. How many of these cases of unknown origin are attributable to infection from uncooked vegetables can only be guessed at. The fact that in the present instance of water-cress infection so large a proportion (eighteen out of nineteen) of persons who ate the cress developed typhoid is unusually significant. It would appear that this agency for the spread of infection is very efficient.

Water cress is particularly subject to contamination by disease germs, especially when grown in water taken from a stream draining a populated area. The probability of the occurrence of a case of typhoid along the stream and consequent contamination increases, of course, with the size of the drainage area and the population, and is greater with a transient population, as the foreign laborers in the present instance. Celery, lettuce, and cabbage are also subject to contamination, though not apt to come within the range of influence of so large a number

of persons as the water-cress grown in a running stream. The close formation of the stalks and leaves would retain indefinitely the contamination once lodged. Parsley and other herbs must also be given due consideration, although the formation of their leaves makes them less liable to retain contamination. Then there are radishes and other roots.

Where truck is grown for market near big cities, it is often customary to water the vegetables systematically instead of relying on the rain, and the water supplies may, not unlikely, be contaminated. It is not uncommon to use household waste water in the trenches in which celery is grown. Moreover, the vegetables may be contaminated from manure used to fertilize the ground, and in cleaning the farm privy the contents are not infrequently dumped on the barnyard manure pile.

In transporting and marketing, the vegetables and also other foodstuffs are subjected to possible contamination from innumerable sources, including "typhoid carriers," whose influence in the spread of infection is probably very considerable under favorable circumstances. The damp vegetables, lettuce, celery, water-cress, etc., are the most liable to become contaminated in this manner.

The production, transportation, and handling of vegetables, and, indeed, of all foodstuffs are carried on with a certain degree of attention to guarding their becoming infected with disease germs. Educational influences emanating from this Department, as well as from other sources, and legal restrictions wherever applicable, are constantly raising the standards. Nevertheless, to produce these vegetables, gather them, transport them to market, and have them handled by many different persons under conditions which can be relied upon absolutely to guarantee freedom from disease germs would make the cost of foods to the consumers exorbitantly high.

The most practicable and most certain protection against infection from vegetables to be eaten raw, is to be obtained in the process of their preparation for the table. They should be washed in unpolluted water by persons competent to understand the necessity for absolute cleansing and the possible consequences of neglecting this safeguard in a single instance. Under proper direction and management a germicidal disinfectant might be used to advantage.

26. TYPHOID FEVER IN RAUCHTOWN VILLAGE, CLINTON COUNTY.

This epidemic of twelve cases of typhoid fever in the little country village of Rauchtown, of only two hundred inhabitants, is conspicuous and of considerable significance in that the source of infection was found to be a neighboring creek, draining an area of considerable size quite generally known to be inhabited, from which stream most of the inhabitants dipped and carried the water supplies of their households. Due consideration of the rural practice of obtaining a water supply here illustrated, and of the disaster to the village, leads to interesting conclusions.

Assistant Engineer Wm. H. Ennis, was sent to Rauchtown December 15, 1913, to investigate. Assistant Engineer R. B. Styer and Inspectors I. F. Zeigler and T. A. Hugg, were detailed to assist. A telephone report had considerably exaggerated the extent of the outbreak and the territory involved. The men arrived late in the afternoon and by the next morning had done everything possible in the village. An inspector was left to follow up stream pollution notices served on properties in the town and along the stream above it.

Rauchtown is in Crawford Township, Clinton County, ten miles east of Lock Haven, the County Seat. The first inhabitants were engaged in lumbering, which still is carried on to a limited extent. There is also a grist mill and some of the people work in the railroad yards at Jersey Shore, five miles north.

Antis Creek, also called Rauch Creek, rises five miles south of Rauchtown, flows north skirting the village on the east and six miles below joins the West Branch of the Susquehanna River.

The report of Mr. Ennis on the investigation and the precautionary measures instituted, is given in the following paragraphs.

The village is without a sewerage system. The method of excrement disposal is principally into dug privy vaults although there are also a few surface privies and cesspools, perhaps fifty such receptacles in all, most of which are fairly well maintained. Kitchen waste and wash water are disposed of on the ground surface and in many instances into street gutters.

There is no water works system in Rauchtown. Most of the inhabitants obtain their water supply by dipping water from Antis Creek at various places along its course. There are a few dug wells on individual estates and also a few cisterns. The owner of the grist mill pipes the creek water to his residence from the head-race which furnishes water power to the mill.

In Antis Creek above the village is constructed an earthen dam eight feet high by thirty feet long built to store water for the grist mill. The head-race above mentioned extends from the dam to a point below the mill, a distance of about a thousand feet. The water from the race is conducted to turbines in the mill through two eighteen inch diameter pipes. The excess water from the race and the discharge from the turbines returns to the creek channel before it passes through the village.

Typhoid Fever.

Immediately on the arrival of the Department's officers, investigations were made to ascertain the cause of the transmission of the infection of typhoid fever. A census of all the cases was made. Water samples of the creek and private well supplies were taken for bacteriological examinations in the Department's Laboratory, and a sanitary survey of the watershed of the creek above the town was made. Altogether there were twelve cases of typhoid fever in the village and it was reported that prior to the outbreak dysentery had been prevalent.

As a result of the sanitary inspection on the watershed it was ascertained that there are three occupied and two unoccupied lumber camps and two farmsteads located on the shed of eight square miles above the village. Altogether there are only thirty permanent residents on the watershed. At two of the lumber camps there were found pollutions from a barn-yard and pig-pen. At one of the farmsteads which was occupied by J. C. Kanawel, there was found a pollution to a small tributary of the creek caused by surface privy, also by kitchen waste and wash water.

The Kanawel residence is a thousand feet distant from the headrace of the mill on a precipitous mountain side. A small run flowing from a spring passes within a few feet to the east of the dwelling house, and another small run issuing from marsh land on the opposite side of the house and immediately below a surface privy, also flows to the race.

On October 15th, Mrs. Kanawel began to feel ill but continued with her household duties until October 22nd, at which time a physician was called in and diagnosed her case as typhoid fever. From this date the patient was confined to her bed and the husband acted as nurse. On November 22nd the patient died. During the intervening time between the onset and the doctor's first visit the outside privy was used by the patient and all kitchen waste and wash water from the house were thrown on the ground surface on either side of the dwelling. Most of it, however, was thrown on the marsh land. After the doctor's visit the patient's stools were buried, although the wash water continued to be thrown on the ground without any attempt at disinfection.

The Department officers immediately had the contents of the privy disinfected and buried and a generous amount of lime was scattered over the ground surface of the Kanawel property. Abatement notices were served on all polluting properties on the watershed and in the town as well.

Warning signs notifying the public of the danger of drinking the creek water, were placed at all conspicuous places along the banks of Antis Creek, and each and every householder was also verbally advised to boil any and all water used from this source.

The canvas made by Department officers of the individual cases of typhoid among the residents of Rauchtown, gives the following information:

	Name.	Date of Onset.	Age.	Sex.*		Occupation.
				M.	F.	
1	Russel Getgen,	Nov. 1,	15	*	.....	School.
2	Rocky K. Homler,	Nov. 22,	12	*	.....	School.
3	Osman Webner,	Nov. 24,	51	*	.....	Laborer.
4	Mrs. Luther Smith,	Nov. 24,	42	.....	*	Housewife.
5	Phroney Smith,	Nov. 24,	19	.....	*	At home.
6	H. J. Allen,	Nov. 24,	64	*	.....	Laborer.
7	Leslie Homler,	Dec. 3,	22	*	.....	Mill hand.
8	Mrs. Leslie Homler,	Dec. 3,	20	.....	*	Housewife.
9	Turah Homler,	Dec. 8,	15	.....	*	School.
10	Byron Welshance,	Dec. 3,	8	*	.....	School.
11	Everett Sewitzer,	Dec. 13,	4	*	.....	At home.
12	Hattie Smith,	Dec. 18,	33	.....	*	Housewife.

	Water At Home.	Other Water.	Milk.	Remarks.
1	Rauch Creek,	Spring,	A. E. Welshance	
2	Rauch Creek,	.....	W. Welshance.	
3	Rouch Creek,	.....	A. E. Welshance.	
4	Rauch Creek,	.....	A. E. Welshance.	
5	Rauch Creek,	.....	A. E. Welshance.	
6	Rauch Creek,	.....	A. E. Welshance.	
7	Rauch Creek,	.....	W. Welshance,	Related to No. 2.
8	Rauch Creek,	.....	W. Welshance,	Related to No. 2.
9	Rauch Creek,	.....	W. Welshance,	Related to No. 2.
10	Rauch Creek,	.....	Own Cow.	
11	Rauch Creek,	.....	Own Cow.	
12	Rauch Creek,	.....	Own Cow.	

In the following table are the results of bacteriological examinations made in the Department Laboratory, of water samples taken at Rauchtown:

	Bacteria per c.c.	B. Coli per c.c.
1. Borsius Spring,	28	0
2. Kanawel Run,	500	6
3. Run below swamp,	500	2
4. Head Race,	28	0
5. Tap, P. J. Homler residence, from Race,	40	0
6. Tap, J. F. Brosius' cistern,	32	0
7. Well, N. H. Homler,	40	0
8. Dug well, J. A. Sheen,	400	0
9. Rauch Creek,	60	0
10. Rauch Creek,	40	0

Consideration of this report might lead to some suspicion of the milk supplies from the two dealers by the same name, E. A. Welshance and W. Welshance, but these men lived several hundred feet apart and were practically the only dealers in the village. It was customary for the people to bring their own receptacles to the milk house and there have them filled. The milk supply does not appear to have any bearing on the typhoid fever.

Conclusions.

That the common water supply, Antis Creek, was the source of infection of the typhoid fever is indisputable in view of all the circumstances. Officers of the Department have, on numerous occasions, warned the inhabitants of Rauchtown of the danger attending the use of the creek water without its being boiled. Unless these warnings are heeded the village may be visited by a repetition of the typhoid outbreak, for, in spite of the most stringent measures in the abatement of stream pollutions, some contamination from around the dwellings and from the public roads will necessarily be carried to the stream by scouring rains. There is some talk of the introduction of a water system by several of the influential residents, and if this is accomplished it will, of course, relieve the present situation.

During 1910 a sanitary survey of the drainage area above the village was made by representatives of the Department and all pollutions on the shed were abated at that time. Since then a local health officer, residing in Rauchtown, has been delegated to patrol the stream from time to time in order to cause the abatement of pollutions that may arise and maintain the purity of the stream at as high a standard as possible.

This epidemic, with all the suffering that it entailed in the little village, might probably have been avoided entirely had the seriousness of the possible and actual effects of stream pollution upon the people downstream been appreciated by those living farther up the creek, and had the continued efforts of the State Department of Health and its local health officer met with complete co-operation. There were only twelve cases but this little group, occuring under circumstances which make it possible to trace them to their source of infection, illustrates forcibly what is probably one of the important reasons for the disgracefully high rate of rural typhoid fever, namely, crude, careless methods of disposal of excrement and waste water near the headwaters of little streams which, farther down, are used promiscuously for drinking, household purposes, washing milk cans, et cetera, sometimes continuously, as here, and sometimes only in emergencies.

Occasionally isolated instances of transmission of typhoid fever or other water borne disease, in this way, come to light, but seldom so conspicuous an illustration as the present. It emphasizes the very great importance of this Department's campaign to bring about the abatement of the up-stream pollutions of waters in rural districts, even though the streams are not the immediate sources of extensive systems of public water supply. Not a few short-sighted persons have expressed doubt as to the need for this work of stream abatement in rural districts and such persons should consider carefully the circumstances of this outbreak of typhoid fever at Rauchtown, merely one example of many similar though less patent occurrences throughout the State.

27. TYPHOID FEVER IN READING.

During January and February, 1913, there were one hundred and fifty-eight cases of typhoid fever reported from the city of Reading. Assistant Engineer Paul Hooker was sent to this place, February 8th, and remained until February 17th, conducting with the assistance of Assistant Engineer S. R. Parke and eleven sanitary inspectors, a detailed study of a hundred and twenty-nine of these cases of typhoid, this being all of the cases having dates of onset from December 15, 1912, to February 15, 1913. A thorough investigation was made of the water and milk supplied to each of the cases and of the public and industrial water supplies; and the other customary lines of investigation were followed out. All cases of typhoid fever which had occurred since July 1, 1912, on the watershed of Maiden Creek,

which supplied about two-thirds of the public water, were investigated. The sources of milk supply to each typhoid patient were inspected. The municipal water works system was given detailed study. The account which follows is taken from the report of Mr. Hooker.

It was ascertained that no suspicion should be attached to the milk supplies. There was only one dealer on whose route there were more than five cases of typhoid fever. This man had seventeen cases distributed among twenty-two hundred customers in all parts of the city.

The water supplies at Reading were derived from several sources. Maiden Creek furnished a surface supply amounting to about sixty-four per cent. of the total. This water was treated with about four-tenth parts of copper sulphate to the million, but was not then subject to filtration, although a filter plant was under construction. The Antietam supply furnished about one-fifth of the total, this being filtered water. The Bernhart supply furnished fourteen per cent. and the Egelman supply two per cent. of the total, both being filtered. The Bernhart filtered supply was regularly augumented by the addition of unfiltered Maiden Creek water.

Prior to December 10th, practically all of the Maiden Creek water passed through the Hampden reservoir, and had the benefit of sedimentation for about three days after treatment with copper sulphate. On that date the reservoir was cut out of service for repairs and the water pumped directly to the system. On February 10th, this reservoir was again placed in service.

Ninety-nine per cent. of the typhoid cases used Maiden Creek water at home or at work either unmixed or mixed with Bernhart filtered water. These supplies combined furnished seventy-eight per cent. of the total water supply of the city.

There was a heavy snow storm late in December followed by warm weather, and then a heavy rainfall. Analyses of the water made by the city during December and January gave negative tests late in December, and early in January, and then gradual improvement until January 23d, after which the results were all negative.

The dates of onset corresponded closely in point of time to what might be expected had the Maiden Creek water carried typhoid infection at the times when the presumptive tests for sewage pollution were positive.

After July 1st, 1912, thirty-three cases of typhoid fever occurred on nineteen properties of the Maiden Creek watershed. Department inspectors visited all of these properties on February 11th, and found no pollutions and no active cases on the date of inspection. It is considered a safe assumption, however, that many of these cases were or had been carriers of typhoid during convalescence, and that infection from some of them was washed into the stream by rain, notably the scouring downfall of December 30th.

On January 5th and 7th, the Hampden reservoir, during repairs, was partly filled and emptied into the mains. One of the laborers employed had a case of typhoid fever at his home and this man waded in the water of the reservoir in the course of his work. This incident may have a slight significance.

On February 10th, orders were issued by the Commissioner of Health, that the public be warned to boil all water used for domestic purposes, and that the dose of copper sulphate applied to the Maiden Creek water be increased from about four tenths to approximately eight tenths parts in a million. This dose was again slightly increased on March 17th. Subsequently, at the suggestion of the Department, chlorinated lime was substituted for copper sulphate, the change being made on June 13th, 1913.

Discussion.

Reading had a population in 1910 of 96,000. Typhoid has been endemic. Since December 1905, there has been no month during which typhoid fever cases were not reported. In 1906, there were 222 cases; in 1907, 244 cases; in 1908, 943 cases, including an epidemic in November and December; in 1909, 297 cases; in 1910, 230 cases; in 1911, 169 cases; and in 1912, 180 cases. The greatest number of cases reported for January or February in any one of the years quoted prior to 1913, was seventeen while in 1913, there were thirty-two cases reported in January, and 126 cases in February. The only unusual circumstance which would account for the notable increase in the number of cases appears to be the combination of conditions affecting the water supply as noted above. Had the Hampden reservoir been in service and a period of detention for the treated Maiden Creek been thus afforded when the heavily polluted water came down the creek following the heavy rain, it is probable that the number of typhoid fever cases would have been materially smaller. With the installation of the Maiden Creek filters in the fall of 1913, it is believed that Reading will have a much lower typhoid fever rate as the entire city is now supplied with filtered water, and experience elsewhere warrants this expectation.

28. REPORT ON AN OUTBREAK OF TYPHOID FEVER AT SELLERSVILLE AND THE PATROL OF THE NORTHEAST BRANCH OF PERKIOMEN CREEK.

There was an epidemic of typhoid fever in Sellersville in August and September. The public water supply was investigated by an engineer of the Department and twenty-eight cases of the disease were canvassed by Department Inspectors. The medical features of the epidemic were investigated by the Medical Division of the Department. The work was part of a sanitary survey of the drainage area of Perkiomen Creek.

Chief Engineer F. Herbert Snow, at the direction of the Commissioner of Health, traversed the course of Perkiomen Creek and its principal tributaries at the beginning of August and established a patrol of the streams by Department Inspectors.

It was reported to the Department of Health that a notable number of campers and other summer visitors along this creek have gone back to their permanent homes with typhoid fever. They were careless in their use of the creek water and in bathing in it. Moreover, at the numerous dairy farms along the creek, from which milk is shipped to Philadelphia, Norristown, and other neighboring towns, the cattle were allowed to wade in the stream in many instances. It is believed that a not inconsiderable part of the typhoid fever in Philadelphia, and that of some of the other towns, may be attributable to these practices.

The object of the sanitary survey was to see to it that dairy cattle were not allowed access to the stream and to warn residents, and especially campers, of the danger incident to using the water or bathing in it, especially because of the presence of typhoid fever in towns along the stream.

The creek rises in the sourthern part of Lehigh County and flows in a general southerly direction through the western part of Montgomery County to its confluence with the Schuylkill River, three miles below Phoenixville. The Perkiomen Railroad follows the course of the creek. The valley is a prosperous agricultural district and there are thriving small towns along the creek and railroad.

The Northeast Branch of Perkiomen Creek, joining the main stream ten miles above the river, flows southwesterly from Perkasie and Sellersville. The patrol of this stream was under the direction of Assistant Engineer William H. Ennis with Inspectors Claypoole, Hellings, and Henry Andrews. The greatest vigilance was exercised below Sellersville and Perkasie, where there were a number of cases of typhoid fever. Especial attention was given to repairs of Perkasie's sewage treatment plant which had been allowed seriously to run down.

The investigation of typhoid fever at Sellersville and of the town's public water supply, and the examination of the Perkasie sewage treatment plant, all conducted in connection with the survey of this branch of the creek, are here set forth.

Patrol of the Creek.

A daily patrol of the stream was maintained up to September 19th, and from the reports of the patrol it is believed that the orders not to allow cattle access to the stream were complied with although it was somewhat of a hardship for a few of the farmers whose ordinary water supplies were low during the dry weather. No camps were located along the creek during this period although the ground is usually a favorite one. There were eighty-three dairy farms investigated along the Northeast Branch of Perkiomen Creek below Perkasie. Of this number twenty-seven had been accustomed to allow the cattle access to the creek water thus permitting the cows' teats possibly to become contaminated, resulting, in turn, in the infection of the milk, under common milking methods.

Perkasie Sewage Treatment Plant.

A public sewerage system is maintained in Perkasie by a private individual under a municipal franchise and the sewage is treated in a plant located down-stream opposite Sellersville. The sewage treatment plant was constructed under a permit from this Department in 1909 and the report for that year describes the works. The plant, however, has not been kept in proper condition partly owing to difficulties with the outfall sewer which ran through quicksands and partly because of litigation relative to a new right of way. Excessive storms flows had reached the plant and made it hard to maintain the filter beds. At the time of this investigation there were large holes in the filtering material and the beds were overrun. The chlorinated lime dosing apparatus was clogged.

Under the supervision of the Engineer of the Department the plant was thoroughly overhauled and put in first-class working order at the same time that the precautions were taken to keep the dairy cattle out of the creek.

Sellersville Sewerage.

Although Sellersville has no comprehensive public sewerage system there are two storm culverts to which individual sewers have been connected from time to time, now accommodating about thirty houses. There are a few connections to the Perkasie main outfall sewer passing through the outskirts. Otherwise, privies,

cess-pools, and surface drainage are in use. The Department has made a house to house canvass of pollutions but the issuance of abatement orders has been temporarily postponed because comprehensive sewerage plans are being prepared providing for a connection with the Perkasie system and the enlargement of the treatment plant. These plans have not yet been formally adopted by the local authorities for submission to this Department for approval.

Sellersville Water Works.

The Sellersville municipal water works system was investigated, because of the typhoid fever in the town, simultaneously with the beginning of the investigation down-stream along the creek. The local health authorities were at once advised to notify the public to boil all water and, incidentally, milk also, as a precautionary measure, because part of the supply is obtained from Three-Mile Run which drains an area of less than one square mile, partly cultivated and containing eight dwellings and one hotel. Most of the habitations, however, are near the watershed line and a sanitary inspection did not reveal any pollutions of the surface water. The stream was nearly dried up at this time. The intake reservoir is located two and one-half miles northwest of Sellersville and has a capacity of about five million gallons and an elevation of over two hundred feet above the business district.

Additional supplies are obtained from three springs well protected by masonry structures and discharging into the intake dam; and from two deep drilled wells cased to rock, one being pumped into the intake dam and the other into the distributing reservoir.

The distributing reservoir is lined with brick and cement mortar. It has a capacity of one million one hundred thousand gallons and is thirty feet lower than the intake reservoir. It is connected with the intake reservoir by a six-inch pipe three-quarters of a mile long and is protected from surface drainage. An eight-inch gravity main one and a half miles long leads to the town from the distributing reservoir, which may be by-passed.

Bacteriological analyses were made of samples collected from the water works system but neither these results nor any other information obtained gave any conclusive evidence that the public water supply had been a factor in the spread of typhoid fever.

The intake reservoir and the distributing reservoir had been drained, cleaned and sterilized about August 1st, before the Department's investigation. Since that date there had been no water in the channel of the stream entering the intake reservoir and it was not thought necessary to repeat the cleaning. All dead ends of the distributing system were flushed. The officials of water works were advised that it would be necessary to provide for by-passing the surface stream around the reservoir and this was supplemented by the following written order from the Commissioner of Health:

"August 22, 1913."

"To the President and Members of Borough Council,
Sellersville, Penna.

"Gentlemen:—

This is to inform you that Three Mile Run, which furnishes part of the water supply to the public at Sellersville, cannot longer be considered by this Department as a safe and satisfactory source of water supply fit for human consumption without purification by filtration or other approved methods. Therefore, you are hereby and herein notified to at once discontinue the use of this supply.

Very truly yours,

(Signed) Samuel G. Dixon."

Typhoid Fever in Sellersville.

The Department officers made a census of twenty-eight cases of typhoid fever in Sellersville during the investigation. The summary of the data collected is given in the following table:

TYPHOID FEVER CASES IN SELLERSVILLE. CENSUS BY DEPARTMENT OFFICERS.

	Name.	Occupation	Onset.	Age.	Sex. M.	Sex. F.	Water Supply. At Home	Water Supply. Other Water.	Milk Supply.	Sewage Disposal.	Remarks.
1	Lena Singmaster, ..	Housewife, ..	June 10,	39	....	F.	Borough, .	None, ...	A. Nyce, ...	Cesspool, ...	
2	Paul Kline, ...	Brass moulder.	July 10,	18	M.	....	Borough, .	None, ...	A. Nyce, ...	Privy, ...	Swam in Perkiomen Creek.
3	Edith Singmaster, .	School, ...	July 18,	10	....	F.	Borough, .	None, ...	A. Nyce, ...	Cesspool, ...	Daughter of No. 1.
4	Sofia Hoot, ...	Housewife, ..	Aug. 1,	51	....	F.	Borough, .	None, ...	C. Smith, ...	Cesspool, ...	
5	Amandus Trumbower	Cigar maker,.	Aug. 2,	48	M.	....	Borough, .	None, ...	A. Nyce and Smith,..	Cesspool, ...	Visited Nos. 1 and 3.
6	Viola Renner, ...	At home, ...	Aug. 2,	7	....	F.	Borough, .	Drilled well, ...	H. Clymer and Smith,	Cesspool, ...	
7	J. P. Renner, ...	School, ...	Aug. 7,	14	M.	....	Borough, .	None, ...	Clymer and Smith, ..	Cesspool, ...	
8	Ella Daub, ...	Housewife, ..	Aug. 7,	30	....	F.	Borough.	Dug well, ...	Smith, ...	Cesspool, ...	
9	Dr. A. Fritz, Jr., .	Physician, ...	Aug. 12,	38	M.	....	Borough, .	None, ...	Smith and Clymer, ..	Cesspool, ...	Physician attending Nos. 1, 2 and 3.
10	Irene Rausch, ...	Cigar maker,	Aug. 9,	26	....	F.	Borough, .	None, ...	Smith, ...	Privy, ...	
11	Flora Baerkemeyer,	Housekeeper,	Aug. 12,	43	....	F.	Borough, .	None, ...	Smith, ...	Cesspool, ...	
12	Annie Daub, ...	Cigar maker,	Aug. 15,	36	....	F.	Borough.	Allentown and drilled well.	Nyce and Smith, ...	Cesspool, ...	
13	Jennie Burkhart, ..	Housewife, ..	Aug. 18,	37	....	F.	Borough, .	Hellertown, ...	Nyce and Clymer, ..	Cesspool, ...	
14	Rose Haines, ...	Housewife, ..	Aug. 20,	31	....	F.	Borough, .	Philadelphia, ...	Smith, ...	Cesspool, ...	
15	U. Aldefer, ...	Polisher, ...	Aug. 21,	21	M.	....	Dug well,	Borough and Philadelphia.	Nyce, ...	Privy, ...	
16	Cora Witch, ...	School, ...	Aug. 24,	12	....	F.	Dug well,	Borough, ...	A. Nyce, ...	Privy, ...	
17	Amelia Strahl, ...	Housewife, ..	Aug. 25,	48	....	F.	Dug well,	Atlantic city, ...	Smith and Clymer,..	Privy, ...	
18	Clinton Kemerer, .	Cigar maker,	Aug. 28,	38	M.	....	Borough, .	Atlantic city, ...	A. Nyce, ...	Privy, ...	
19	Ellis Delaney, ...	School, ...	Sept. 1,	14	M.	....	Borough, .	None, ...	Nyce and Cristman,	Privy, ...	
20	Albert Hoffman, ..	Tailor, ...	Sept. 1,	15	M.	....	Borough, .	None, ...	Smith, ...	Privy, ...	
21	Fred Schluben, ...	Machinist, ...	Sept. 1,	22	M.	....	Borough, .	None, ...	Nyce, ...	Privy, ...	
22	Oscar Schmidt, ...	Gauge works,	Sept. 2,	21	M.	....	Borough, .	None, ...	Nyce, ...	Privy, ...	
23	Katie Shelly, ...	Box maker, ..	Sept. 5,	17	....	F.	Borough, .	South Bethlehem,	Clymer, ...	Privy, ...	
24	Earl Schawosky, ...	Gauge works,	Sept. 7,	20	M.	....	Borough, .	None, ...	Nyce, ...	Privy, ...	
25	Armand Krider, ...	School, ...	Sept. 9,	19	M.	....	Borough.	Philadelphia, ...	Smith, ...	Privy, ...	Attended school in Philadelphia.
26	Esther Hebel, ...	At home, ...	Sept. 12,	15	....	F.	Borough, .	Souderton, ...	Smith, ...	Cesspool, ...	In contact with cases at Souderton.
27	Lewis Strahl, ...	At home, ...	Sept. 15,	13	M.	....	Dug well,	Borough, ...	Smith, ...	Privy, ...	In contact with No. 17.
28	H. C. Shelly, ...	Gauge works,	Oct. 1,	21	M.	....	Borough, .	Lansdale and Souderton.	Clymer, ...	Privy, ...	Brother of No. 23.

From the foregoing table it appears that all but one of the twenty-eight cases had used the borough water supply. The precautions taken by the local authorities in cleaning the reservoir about August first, and the additional emergency measures, relative to the water supply, instituted when the Department's officers came to Sellersville, a few days later, failed, however, to check the spread of the disease, and this fact, together with the lack of evidence of pollution of the water supply either from the bacteriological analyses or the physical examination of the drainage area nd water works, were strong arguments that the source of infection must be sought elsewhere. The public supply was very generally used throughout Sellersville. There had been no typhoid fever on the drainage area of Three-Mile Run for two years.

The milk supply for the typhoid fever patients had been furnished by three milk dealers, but it was found upon investigation that these men had made a common practice of exchanging milk. One of the dealers conducts his own dairy farm and another is supplied from two farms located in the valley, above Sellersville. The third dealer receives his supply from two dairy farms situated a few miles downstream below Sellersville and the Perkasie sewage disposal plant.

At the dairies below Sellersville the cattle had been permitted to wade in the stream prior to the establishment of the patrol by the Department. The discontinuance of this practice on August 6th was not followed, however, by a diminution of the spread of typhoid fever in the borough. The dairies were found in fair sanitary condition and the water supplies were reasonably beyond suspicion.

Associate Chief Medical Inspector, Dr. C. J. Hunt visited Sellersville about August 27th and reviewed the medical features of the epidemic. At the principal one of the two dairy farms down-stream the dairyman's wife had had typhoid fever seven years ago but there had been no history of the disease on the farm since. She had suffered, however, more or less with dysentery during the summer and she had milked the cows and handled the milk. The dairyman's wife was found to be a typhoid carrier, as evidenced by the examination at the Department's laboratory during September of specimens of blood and feces. Upon determination of this fact the local health officials were at once notified by the Department under date of September 17th, and strict remedial measures were instituted at the dairy. At the time of the medical investigation at the dairy precautionary measures were advised and about two weeks thereafter there was a marked falling off in the occurrence of typhoid cases in the borough.

The last few cases of the census as well as some of the earlier cases, five or six in all, may reasonably be set down as due to secondary infection.

The milking and handling the milk by a typhoid carrier at the dairy farm and the exchange of milk among the town dealers are believed to have been the cause of the epidemic.

29. TYPHOID FEVER AT SHARON AND FARRELL, MERCER COUNTY.

Twenty typhoid cases in Sharon (over 15,000 population) and Farrell (over 10,000 population) were reported to the State Department of Health by the local Boards of Health in December 1912. Need of assistance from this Department was made evident by the reports in January which showed no diminution of cases. On January 16th, Assistant Engineer Ralph E. Irwin was sent to Sharon to make a thorough investigation and he remained there until January 27th. Dr. C. J. Hunt, Associate Chief Medical Inspector, visited the towns for a couple of days to advise on medical questions. Mr. Irwin was assisted by Assistant Engineer C. L. Siebert and Inspectors C. T. Maclay, D. M. Irwin and D. J. Marshall. One hundred and sixty-seven cases from May 1912 to February 1913 inclusive were investigated by the Department.

The cause of the epidemic was reasonably attributable to infection through the public water supply, drawn from the Shenango River, a stream polluted by the sewage of towns where typhoid fever had been prevalent.

The supply for the two boroughs, furnished by the Sharon Water Works Company, is filtered in a rapid sand filtration plant, treated with chlorinated lime, and distributed to about 20,000 consumers in a total population of over 26,000. The filtration plant was installed before this Department exercised its present comprehensive supervisory powers relative to the extension of water works.

Warnings were published in the newspapers to boil all water. A close watch was kept on the operation of the chlorinated lime disinfecting apparatus at the filter plant. Water works drawing from the Shenango River below Sharon were warned of the presence of typhoid fever and the need for exercising emergency precautions.

The procedure at the filter plant and in the use of chemical coagulants and the disinfectant was thoroughly investigated by the Department's engineers. The need of improvements in the method of operation and control had previously been impressed upon the water company by letters from this Department and, as the result of a conference of officers of the water company with the Commissioner of Health, the Company undertook to study the problem and devise improvements to place the operation of its plant on a modern basis but was slow to realize the imminent danger and need of expedition. The investigation, including the bacteriological analysis of many samples, showed that colon bacilli were at times in the

filtered water and that the supervision of the chlorinated lime application was unreliable and that more radical measures for the improvement of the plant were necessary.

A decree was issued to the water company by the Commissioner of Health specifically stipulating needed improvements, which the company provided for, including arrangements for expert supervision of the plant and weekly reports of the operation to the State Department of Health.

The dates of onset of cases learned of from the local physicians, investigated by the Department's officers and tabulated hereinafter show: first, that the outbreak had made considerable headway during November 1912 and reached a climax in January (there were 141 onsets in the two boroughs in November, December and up to January 26th); second, that from January 26th, (ten days, about the minimum incubation period of the disease, after the Department took hold of the situation), to the end of February, only fifteen cases of typhoid developed. This is not an excessive number to be attributed to secondary infection due to individual personal negligence.

A comparison of the cases as reported with those entered in the census according to the time of onset brings out a detail of much significance. There were many delays in the reports; numerous cases of a far earlier date were not recorded until February. A large number, about forty, appear not to have been reported at all. Such irregularities are unfortunately still common all over the State. For this particular epidemic the result was that the returns of the Boards of Health of the boroughs and the official reports through them to the State Department of Health showed no alarming number of cases of typhoid fever until December. Through this delay of several weeks in making evident the presence and extent of the outbreak valuable time was lost and the adoption of protective measures much deferred. This is another impressive illustration of the importance of prompt reports of cases of typhoid fever and other communicable diseases. The cases in Sharon and Farrell were scattered and the presence of the disease did not become conspicuous until indicated by delayed reports.

Assistant Engineer Irwin's report follows in part, giving the details of the investigation of the typhoid fever cases and of the milk supplies and private water supplies, eliminating these as factors in the spread of the epidemic.

Typhoid Fever Record.

Prior to the present outbreak of typhoid fever the general conditions remained the same as usual as far as could be learned. Typhoid fever had not appeared in an epidemic form, but the number of cases had been excessive. Typhoid fever had existed in the boroughs and along the Shenango River above and also in the boroughs below Sharon and Farrell.

Typhoid Fever Cases Reported to the State Department of Health.

SHARON.

	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
January,	.....	2	7	57	2	11	6	3	21
February,	.....	0	1	3	9	5	2	2	20
March,	.....	0	1	10	0	5	1	9	4
April,	.....	1	0	2	1	1	1	0	1
May,	.....	.....	.....	.....	0	5	4	3	1
June,	.....	1	2	.....	0	0	3	1	1
July,	.....	.....	3	.....	6	2	3	0	6
August,	.....	.....	.....	1	3	7	3	3	3
September,	.....	2	.....	5	1	1	1	3	1
October,	.....	1	.....	.....	2	4	5	3	1
November,	1	1	3	6	3	14	2	3	4
December,	19	2	25	7	0	3	1	7	2
Total,	20	10	42	81	27	58	32	37	101

SOUTH SHARON OR FARRELL.*

	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
January,	.....	.....	.....	.....	2	7	3	0	17
February,	.....	.....	.....	.....	0	1	0	1	8
March,	.....	.....	.....	.....	0	0	1	1	2
April,	.....	.....	0	.....	0	.....	0	1	1
May,	.....	.....	.....	.....	0	.....	0	0	0
June,	.....	.....	.....	.....	1	.....	1	0	0
July,	.....	.....	.....	.....	0	3	0	0	.....
August,	.....	.....	.....	1	4	1	0	0	1
September,	.....	.....	.....	.....	2	0	1	3	0
October,	.....	.....	.....	.....	0	2	1	0	.....
November,	.....	.....	.....	.....	0	4	1	2	0
December,	.....	.....	.....	0	4	1	1	13	0
Total,	.....	.....	0	1	13	19	9	21	29

*Changed to Farrell in July, 1912. Blank spaces=no reports.

During the investigation a census was made in Sharon and Farrell of all cases occurring after the first of May 1912. It was found that ninety-seven cases were attributed to Sharon and seventy cases to Farrell. A census of these cases showed the date of onset to be as given in the following table:

DATES OF ONSET IN EACH BOROUGH AND NUMBER OF TYPHOID CASES.

	Sharon.						Farrell.						1913.	
	1912.				1913.		1912.							
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	May.	Aug.	Sept.	Oct.	Nov.	Feb.	Jan.	Dec.
1,	....	....	....	3	5	...	....	....	....	2	....	3	2	....
2,	....	....	....	1	....	1	....	....	....	....	....	3	....	1
3,	....	....	....	....	1	1	....	....	....	....	....	1	....	....
4,	....	....	1	....	1	...	....	....	....	....	....	....	....	....
5,	....	1	....	....	1	1	....	....	....	....	....	....	....	....
6,	....	1	1	1	3	1	....	....	....	....	....	....	2	....
7,	....	....	....	....	2	....	....	....	....	....	....	1	....	....
8.	....	....	1	....	2	...	....	....	....	....	....	1	1	....
9,	....	....	...	1	1	2	....	....	....	....	....	1	1	1
10,	....	....	1	....	4	2	....	....	....	....	....	1	3	....
11,	....	....	1	....	4	....	....	....	....	....	....	1	....	....
12,	....	....	....	....	....	....	....	....	....	....	....	1	1	....
13,	....	....	....	....	1	....	....	....	....	....	....	1	1	....
14,	....	....	....	....	3	....	....	....	....	....	....	1	1	1
15,	1	....	....	1	3	....	....	....	....	....	....	1	1	....
16,	....	....	....	2	5	....	....	....	....	....	....	....	2	....
17.	....	....	....	....	....	....	....	....	....	....	....	1	1	....
18.	....	....	1	3	4	....	....	....	....	....	....	2	....	....
19.	....	....	....	....	....	....	....	....	....	....	....	2	....	....
20.	....	1	2	1	2	....	....	....	1	....	1	1	3	....
21,	....	....	....	2	....	....	....	....	....	....	1	....	1	....
22,	....	....	....	....	1	....	....	....	....	....	....	....	3	....
23,	....	1	....	....	2	....	....	....	1	....	1	1	....	....
24,	....	....	....	....	1	....	....	....	....	....	1	....	....	....
25,	....	....	....	1	2	....	....	....	....	....	....	2	1	....
26,	....	....	....	2	1	....	....	1	....	....	2	....	....	....
27,	....	....	....	....	1	....	1	....	....	....	....	1	....	....
28,	....	....	....	1	1	....	....	....	....	....	4	1	....	....
29,	....	....	1	....	....	....	....	....	....	....	....	....	....	....
30,	....	....	3	1	1	....	....	....	....	....	....	....	....	....
31,	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total,	1	4	12	20	52	8	1	1	2	2	10	27	24	3

The age and sex of the cases in each of the boroughs are shown in the following table:

AGE AND SEX.

Age.	Sharon.		Farrell.	
	Male.	Female.	Male.	Female.
0- 4,	10	2	5	1
5- 9,	8	12	8	3
10-14,	6	5	5	3
15-19,	4	3	9	2
20-24,	10	8	10	3
25-29,	7	5	4	7
30-34,	1	2	3	3
35-39,	5	3	2	.....
40-44,	2	2	.....	1
45-49,	.....	.....	.....	.....
50-54,	1	.....	.....	.....
55-59,	2	.....	.....	.....
Total,	56	41	46	24

In the following table is shown the occupation of the cases included in the census in each borough:

OCCUPATION OF CASES.

	Sharon.	Farrel.
Student public school,	28	18
Carnegie Steel Company,	1	20
Housewife,	10	14
Tin mille,	..	3
Tinner,	1	..
None,	17	11
None given,	..	2
City fire department,	..	1
Clerk,	3	1
Barber,	1	..
Domestic,	7	..
Steel worker,	10	..
Laborer,	12	..
Carpenter,	1	..
Boiler maker,	1	..
Railroader,	2	..
Baker,	1	..
Seamstress,	1	..
Township school,	1	..
Total,	97	70

From the foregoing tables it will be noted that a large percentage of the cases occurred among pupils attending public school and among those who are below fifteen years of age, that is in persons who have developed no marked resistance. Other than this exception the cases occurred according to occupation and age as is usual in typhoid fever outbreaks where the infection is attributed to a contaminated public water supply.

The milk supply for the two boroughs according to the record obtained from the fever patients is almost entirely separate. The ninety-seven cases in Sharon obtained their supply from thirty different sources while the seventy cases in Farrell obtained their milk supply from twenty-three different sources. The Jones Dairy of Sharon supplied nineteen cases, one dealer supplied seven, three dealers supplied six cases each, five dealers supplied four cases each, four dealers supplied three cases each, four dealers supplied two cases each and all others had different milk supplies. In Farrell one dealer supplied fourteen cases, another thirteen, another seven and the others still fewer cases. A few dealers in the two boroughs obtained a part of their milk supply from rural villages on the Pennsylvania Railroad above Greenville, but the greater portion of the milk was brought in from dairies in the surrounding agricultural territory. There was no reason to attribute any typhoid fever cases to infected milk. The milk dealers almost as a whole delivered in bulk from spout cans while the fever cases were in progress.

The cases were distributed throughout both boroughs as would be expected from an infection carried through the public water supply. The better residential sec-

tion was affected as much as the poorer district along the river and joining the business section. A great many of the cases in Farrel occurred in newly built houses as this borough is growing rapidly. Recently the Carnegie Steel Company has erected over three hundred dwellings in Farrell and this section had its portion of the fever cases. The cases cannot be attributed to unsanitary conditions. There appeared in Sharon, along the hill sides, where sanitary conditions were especially good, a number of fever cases proportional to the number occurring in the more densely populated area, near the business district, according to population. In Sharon sixty-seven of the ninety-seven cases were in houses connected with the public sewer system.

In Farrell typhoid fever occurred as frequently in the new residential section as it did in the poorer homes, close to the mill district. Sixty-seven of the seventy typhoid fever cases in Farrell were in houses connected to the public sewer system. All of the 328 houses erected by the Carnegie Steel Company are connected to the public sewer system.

Public sewers from both Sharon and Farrell discharge into the Shenango River without treatment. Upon learning the conditions existing in these two borough in reference to typhoid fever, the City of New Castle Water Company and the Beaver Valley Water Company were notified by telephone concerning the probable pollution from Sharon and Farrell and advised to take additional precautions in treating the public water supply.

Individual Water Supplies.

In both boroughs all individual water supplies used by the typhoid fever cases were sampled by officers from this Department and analyses were made at the Department laboratories. In Sharon twenty drilled wells, six dug wells and two springs were sampled. Twenty-four of the twenty-eight sources were at residences, four were wells at the public schools. The results of all the samples collected showed a relatively low number of bacteria and in no samples were B. Coli found.

In Farrell twenty-eight samples were collected from drilled wells and six from dug wells. Four of these samples were from school supplies and one from a church. The results of these samples showed a very low number of bacteria and no B. Coli. This is a rather remarkable showing for individual water supplies. It is believed that the results are due to the vigilance of the Carnegie Steel Company in caring for their employees. Beginning in September 1911 the Carnegie Steel Company, through its laboratory, made analyses of all the well waters or spring waters used by its employees in Sharon and Farrell, special attention being given to individual supplies in Farrell, as the company owns a large section of this borough. Acting upon the results of the analyses, twenty-six individual water supplies were condemned and closed to use in the two boroughs and the employees of the company were instructed regarding the care which should be exercised in using individual water supplies. There is no reason to think that typhoid fever was caused by an infected individual water supply in either borough.

30. TYPHOID FEVER AT TARENTUM AND BRACKENRIDGE.

During November the number of cases of typhoid fever in Tarentum and Brackenridge, Allegheny County, reported to the State Department of Health reached the proportions of a small epidemic. There occurred in this month twenty-five cases in Tarentum (population 8,172) and seventeen cases in Brackenridge (population 3,797). There have been typhoid outbreaks in this locality in previous years and investigations by this Department have made its officers familiar with local conditions. The public has been frequently and forcibly warned by the health authorities of the danger incident to not boiling water to be used for drinking, culinary and personal purposes. This applies also to some of the private well waters.

On December 3rd, Assistant Engineer, R. E. Irwin, was ordered to go to Tarentum and Brackenridge to make an investigation. Later Assistant Engineer, W. C. Riddle, was detailed with several inspectors to make a house to house canvass in the two boroughs in order to ascertain the general conditions pertaining to the use of the public water supply, its quality from time to time in the opinion of the consumers, the practice as to boiling it, and the use of other water supplies. In connection with this canvass detail data were collected relative to all typhoid cases which were found to have occurred during the year. The investigation was continued until December 16th.

The entire distributing district of the Allegheny Valley Water Company, the boroughs of Tarentum and Brackenridge and parts of East Deer and Harrison Townships, Allegheny County, showed an undue prevalence of typhoid, which together with the laxity of the methods of the water company, pointed to the water supply as the source of infection. Therefore, the condition of the filter plant and the method of operation of the water works system were at once given attention.

Public Water Works.

The water supply is derived from a crib in the bed of the Allegheny River opposite Brackenridge up-stream from Tarentum and about sixteen miles above Pitts-

burgh. The water flows to an intake well and is pumped to a filtration plant on the hillside. Adjacent to the filter plant is a storage basin for filtered water from which the distributing system is supplied. The filter plant was installed in 1907, under the provisions of a decree issued to the water company by the State Department of Health. In 1911, and again in 1912, a temporary chlorinated lime disinfecting apparatus was installed at the pumping station under the direction of officers of this Department because of the undue prevalence of typhoid fever, but the water company neglected to maintain the plant in operation after the crises. In the summer of 1913, a similar plant was installed under the direction of a Department officer, to treat the effluent at the filter plant and was in operation as a temporary process when the State Health Officers inspected the plant in December. The equipment and operation of the water works have not been maintained according to the standards of first class engineering practice. The filtration has not been under the direction of expert operators. The decree of the Department providing for the installation of the filter plant stipulates that no other water than that which passes through the filters shall be delivered to the public, and yet on several occasions, particularly to meet emergencies, unfiltered river water has been pumped into the mains of the public system through cross-connections with local industrial plants. This matter has been referred to the Attorney General of the Commonwealth.

The inspection of the filter plant by the officers of this Department at the beginning of the investigation showed that improvements had been made during the summer and the results of bacteriological analyses of samples collected from the water works system and analyzed at the laboratories of the State Department of Health, failed to show contamination of the public water supply at that time.

Municipal Water Works at Tarentum.

A municipal water works system has been nearly completed by the borough of Tarentum and is expected to furnish filtered Allegheny river water to the inhabitants of that town at any early date. The project was brought about by general dissatisfaction with the supply and methods of the Allegheny Valley Water Company and was consummated only after long drawn out litigation in the local courts between the local water company and the borough.

Typhoid Fever Record.

The record of cases of typhoid fever in Tarentum and Brackenridge as reported to the State Department by the local authorities under the State law, is as follows from the beginning of such reports, except that the figures for 1913 have been augmented by additional cases discovered during the special canvass of these two boroughs conducted by the State Health Department officers between December 3rd and December 16th. Zeros represent reports of no cases and dashes represent failure to report

TYPHOID FEVER CASES IN TARENTUM.

Month.	1905	1906	1907	1908	1909	1910	1911	1912	1913
January,	.....	21	22	—	0	0	1	3	1
February,	.....	13	4	0	0	0	8	1	0
March,	.....	5	0	2	1	0	4	[illegible]	1
April,	.....	4	3	3	0	1	2	[illegible]	0
May,	.....	0	17	1	1	0	[illegible]	[illegible]	1
June,	.....	12	—	—	1	1	0	3	3
July,	.....	12	9	[illegible]	2	6	0	[illegible]	3
August,	.....	17	11	—	4	7	[illegible]	4	[illegible]
September,	.....	8	13	—	[illegible]	1	[illegible]	3	[illegible]
October,	.....	3	0	1	[illegible]	3	[illegible]	1	[illegible]
November,	24	6	—	0	0	3	6	0	[illegible]
December,	18	9	[illegible]	0	3	6	[illegible]	0	[illegible]
Total,	52	110	81	9	15	28	73	47	58

TYPHOID FEVER CASES IN BRACKENRIDGE.

Month.	1906	1907	1908	1909	1910	1911	1912	1913
January,	.....	—	—	—	0	3	2	0
February,	.....	—	—	—	1	3	0	1
March,	.....	2	—	2	0	0	0	1
April,	.....	—	—	1	3	0	0	0
May,	.....	—	—	2	0	0	3	1
June,	.....	—	—	0	2	0	0	2
July,	.....	—	—	0	0	0	0	0
August,	.....	—	—	0	3	3	4	1
September,	10	—	—	0	0	8	0	6
October,	—	3	—	0	0	1	2	8
November,	—	—	—	1	2	5	1	17
December,	—	—	—	1	2	1	0	6
Total,	10	5	—	7	13	24	12	43

The number of typhoid cases in the district of the water company in East Deer and Harrison townships was in proportion to those in the two boroughs according to population.

Tarentum showed a high typhoid fever rate until the installation of a filtration plant in 1907 and the incomplete reports for Brackenridge indicate a similar condition there. The marked drop in the prevalence of the disease incident to the filter installation indicates very clearly that the previous typhoid may be attributed to the use of unfiltered river water and shows what a dangerous source of supply this water is.

An epidemic of typhoid developed in 1911, subsequent to an increase in the disease during the previous year. It was found upon investigation by State Health Department officers to be clearly attributable to negligence in the operation of the public water works. The investigation and the emergency measures instituted by this Department are set forth in the Annual Report of 1911. The epidemic of typhoid fever in 1912 in Tarentum but not in Brackenridge, was found to be due to infected private wells.

The investigation by Department officers in December 1913, included a census of all typhoid cases in the two boroughs from July to the time of the investigation. The first cases included in the census were twenty-seven in Tarentum and twenty-six in Brackenridge reported to the investigators by the local health authorities, although their formal reports to the Harrisburg office of the State Department of Health gave a few additional cases. The Department investigators found in Tarentum fourteen additional cases of which five were later reported to Harrisburg while nine were never reported by the local health authorities; also in Brackenridge nine additional cases of which one was later reported to Harrisburg while eight were never reported by the local authorities.

The investigation of the State Department of Health of typhoid fever cases in Tarentum and Brackenridge with dates of onset from July to November inclusive, covered forty-one cases in Tarentum and thirty-five cases in Brackenridge. A few cases in the early part of this period not reported to the Department investigators are not included in these figures nor in the discussions and tables which follow, all substantially as presented in the report of Assistant Engineer Irwin.

CENSUS OF CASES OF TYPHOID FEVER TAKEN BY STATE HEALTH OFFICERS:

Arranged by Dates of Onset.

Day of Month.	Tarentum.					Brackenridge.				
	July.	August.	September.	October.	November.	July.	August.	September.	October.	November.
1,	.....	1	1	.....	2	.....	.....	.....	1	3
2,	.....	.....	.....	1	1	.....	.....	.....	1	1
3,	.....	1	.....	.....	.....	.....	.....	.....	1	.....
4,	.....	.....	.....	.....	3	.....	.....	.....	.....	.....
5,	1	.....	.....	.....	[illegible]	.....	.....	.....	.....	1
6,	.....	.....	.....	.....	1	.....	.....	1	.....	.....
7,	.....	.....	.....	.....	1	.....	.....	1	.....	[illegible]
8,	.....	.....	.....	.....	.....	.....	.....	.....	[illegible]	.....
9,	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
10,	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
11,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12,	.....	.....	.....	.....	.....	.....	.....	[illegible]	.....	.....
13,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14,	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
15,	1	.....	.....	.....	2	.....	.....	1	.....	1
16,	.....	.....	1	.....	1	.....	.....	.....	.....	.....
17,	.....	.....	.....	.....	1	.....	.....	.....	1	.....
18,	.....	.....	.....	.....	1	.....	.....	.....	.....	.....
19,	.....	.....	.....	.....	1	.....	.....	.....	.....	.....
20,	.....	1	.....	1	3	.....	.....	.....	[illegible]	1
21,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22,	.....	.....	.....	.....	1	.....	.....	.....	.....	.....
23,	.....	.....	.....	.....	1	.....	.....	.....	.....	1
24,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25,	.....	1	.....	2	1	.....	.....	1	.....	1
26,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27,	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
28,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29,	.....	.....	.....	1	3	.....	.....	.....	.....	1
30,	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
31,	.....	.....	.....	1	.....	.....	.....	.....	1	.....
Total, ...	2	6	2	6	25	0	1	6	9	19

The age and sex of the cases in the two boroughs are shown in the following table:

Age.	Tarentum.		Brackenridge.	
	Male.	Female.	Male.	Female.
0- 4, ...	1	1	[illegible]	[illegible]
5- 9, ...	8	[illegible]	[illegible]	[illegible]
10-14, ...	[illegible]	1	[illegible]	4
15-19, ...	1	1	1	3
20-24, ...	3	..	[illegible]	..
25-29, ...	1	3	1	1
30-34, ...	[illegible]	..	1	[illegible]
35-39, ...	[illegible]	1	1	1
40-44, ...	[illegible]	1	..	1
45-49, ...	..	1	1	..
50 and over, ...	1	[illegible]	..	1
Total, ...	28	13	13	[illegible]

The occupation of the cases in the two boroughs are shown in the following table:

TARENTUM.

Flaccus Glass Works,	4	Domestic,	2
Child,	6	Second Ward School,	4
First Ward School,	4	At home,	1
Aluminum Works, New Kensington,	1	Cobbler,	1
Housewife,	5	Parochial School,	1
Laborer,	3	Errand boy,	1
West Penn Steel Company,	1	Blacksmith,	1
High School,	2	Allegheny Steel Company,	1
Unknown,	2		
Paperhanger,	1	Total,	41

BRACKENRIDGE.

Child,	3	First Ward School,	2
Pittsburgh Plate Glass Company, Plant No. 1,	1	High School,	1
Public School,	7	Natrona,	1
Child,	3	Second Ward School,	3
Domestic,	3	Preacher,	1
Housewife,	5		
Allegheny Steel Company,	5	Total,	35

Milk Used By Tphoid Cases.

The milk supply in Tarentum for thirty-five of the cases was obtained from thirteen dealers. Three of the cases used no milk and three used condensed milk. Of the thirteen dealers, Breck and Huffman supplied fifteen cases and none of the others supplied over three. Breck and Huffman were large dealers and had an extensive route in both boroughs. There is no reason to think that the infection was caused by an infected milk. Many of the same dealers delivered milk in Brackenridge. Mr. Chas. Wilhelm who supplied two cases in Tarentum, supplied ten cases in Brackenridge and had the largest number in this borough. J. E. Murphy who supplied three cases in Tarentum supplied six cases in Brackenridge. Breck and Huffman who supplied fifteen cases in Tarentum supplied but three cases in Brackenridge. The remainder of the cases in Brackenridge were distributed among seven dealers. Three of the Brackenridge cases used no milk, and two used condensed milk.

Water Used By Typhoid Cases.

The cases in Tarentum all used the public water supply, except one who obtained his entire supply from the Harris well. Sixteen wells and springs were used by the various patients in connection with the public water supply. Three cases obtained water from the First Ward public school in addition to the public water supply, one case in addition to the public supply used the high school well and two used the Second Ward School well. In no instance did more than three cases use the same individual water supply. In Tarentum eighteen cases used the public water supply only and the others used the public supply in connection with ten wells and springs except the one who used from the Harris well. In Brackenridge three cases obtained water from the public school well in addition to the public water supply. The public school wells in both boroughs and seven other individual supplies were sampled by State Health officers and the results of analyses made at the State Health Department laboratories did not show that these sources were contaminated at this time.

The cases in both boroughs were distributed in the low lands as well as on the hillside and throughout the built up incorporated areas.

Township Typhoid Cases.

Four cases occurred in East Deer Township, the date of onset of these cases occurred in October and November and agree with those in the two boroughs and all used the public water supply as well as well water when at work. There were three cases in Harrison Township. The dates of onset were in the early part of November. All of these cases used the public water supply and two used water from wells.

House to House Canvass of Water Company Districts.

On December 12th and 13th, 1913, a special census was made in the boroughs supplied by the Allegheny Valley Water Company. This census consisted of a house to house canvass by inspectors from the State Health Department. In mak-

ing this canvass a special census card form 66C was used at each house visited. When it was found that there had been a case of typhoid fever or dysentery in the household then a census of the case or cases was recorded on the regular typhoid fever census card and submitted with the special census card. This special census was made to learn as near as possible, the exact facts throughout the boroughs concerning the use of the public water supply and individual water supplies. The Department had investigated two other typhoid fever outbreaks in this territory and numerous warnings had been issued concerning the boiling of not only the public water supply but individual water supplies. Also it was known that many of the consumers complained that the public water supply was frequently turbid. It was also thought that the records of the local boards of health in the two boroughs were not complete and that possibly there were typhoid fever cases and dysentery cases throughout the boroughs of which the local boards had no record. The census card form 66C was as follows:

"Form 66C

COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF HEALTH.
SPECIAL CENSUS CARD.

Name, ...
Householder
Street Address, ...
Total population of household, ...
Have you running water in house? .....Do you boil it?.....
Is water ever turbid, ... When.....
Do you use spring or well water .....Do you boil it?.....
If well, is it dug or drilled? ..... Location and name of spring or well, ...
Any typhoid fever during 1913? .....Typhoid census card for each case, ...
Any dysentery in November?.....Typhoid census card for each case, ...
Inspector, ..."

The special census revealed fourteen typhoid fever cases in Tarentum that had not been reported to the investigators, and five cases of dysentery; and in Brackenridge nine cases of typhoid fever not reported to the investigators and one case of dysentery.

The result of the special census in Tarentum, Brackenridge and East Deer Township give the following results concerning the public and individual water supplies:

TARENTUM.

1,664 houses visited
7 houses vacant

1,657 houses occupied having population of 8,172
107 houses having no public water supply of which
33 used drilled wells
65 used dug wells
9 used spring

1,550 houses used public water supply
543 houses boiled the public supply for domestic use

1,007 houses used public water supply unboiled
1,007 houses complained the public supply was turbid as follows:
46 turbid all times
28 turbid on Mondays
97 turbid after rains or high water
836 turbid occasionally

BRACKENRIDGE.

811 houses visited
5 houses vacant.

806 houses occupied having population of 3,797
122 houses having no public water supply of which
48 used drilled wells
63 used dug wells
11 used springs

684 houses used public water supply
103 houses boiled public water supply for domestic use

581 houses used public water unboiled
303 houses complained the public supply was turbid as follows
11 turbid at all times
6 turbid on Mondays
13 turbid after rain or high water
273 turbid occasionally

EAST DEER TOWNSHIP.

403 houses occupied having population of 1,962
34 houses having no public water supply of which
12 used drilled wells
13 used dug wells
9 used springs

369 houses used public water supply
15 houses boiled the public water supply for domestic use

354 houses used public water supply unboiled
134 houses complained that the public supply was turbid as follows:
3 turbid at all times
0 turbid on Mondays
12 turbid after rain or high water
119 turbid occasionally

Summarizing the special census for the entire district it is found that there were 2,866 occupied houses visited representing a population of 13,931. In 2,603 of these homes the public water supply was used. In 661 homes the public water supply was boiled when used for domestic purposes. It will be noted that the great majority of the homes in which the water supply was boiled were in Tarentum. From 1,444 households there were complaints concerning the public water supply. In 1,942 households the public water supply was used unboiled, and, as was previously shown from the regular typhoid census, typhoid fever occurred almost wholly among those using the public water supply. The census indicated that a great deal of the time the tap water was turbid. It was difficult to obtain specific information when turbidity occurred; thirty-four answers to this question indicated that turbidity occurred on Monday. This may be due to the fact that the consumption on Mondays is much greater than on Sundays and the change in velocity through the mains may have been great enough to loosen the deposit in the mains and make the water noticeably turbid. There were 122 complaints that turbid water followed rains or high river stage. It would seem that these complaints were sufficient in number and so distributed over the entire district as to show that there was a considerable change in the character of the supply at these times, and this would indicate that the filter plant was not efficiently operated when the river water was highly turbid.

Conclusions.

Conspicuous among the noteworthy features of the typhoid outbreaks in Tarentum and Brackenridge is the shortsightedness of the policy of this water company which, though it installed a filter plant, has persistently delayed fulfilling the decrees and requirements of the State Department of Health relative to the operation of its water works and has neglected the demands of the public and which consequently must now, it appears, suffer a serious financial loss, due to the installation of a municipal water works system in Tarentum. There are no longer such occurrences in the management of progressive water companies, which realize that their own best interests go hand in hand with those of the public.

Perhaps equally significant is the continued almost utter disregard shown by the public, particularly in Brackenridge and East Deer Township, to repeated notices to boil the water, according to the information furnished by householders. This state of affairs in a district where, moreover, the water has been complained of extensively, illustrates the comparative carelessness so frequently shown toward risks of health and life from using dangerous water. Even in Tarentum where the dissatisfaction of the public has now taken concrete form in the installation of a municipal water works, nearly two-thirds of the consumers in the meantime have been willing to run the risk attendant upon using the water without boiling.

The permanent establishment at an early date of thoroughly efficient filtration, whether by the company or by the municipality, provision that the introduction of raw water may not be necessary even in emergencies, and the closing of dangerous private wells, prominent factors in the past, should result in a marked decrease of typhoid fever in these towns during the coming year.

31. MEASURES TAKEN TO FORESTALL FURTHER SPREAD OF TYPHOID FEVER AT WEST READING THROUGH THE PUBLIC WATER SUPPLY.

The unsatisfactory condition of the public water supply of West Reading Borough and vicinity, a condition which persisted to the end of the year, the imminent danger that an outbreak of typhoid fever, showing eighteen cases in June, might develop into an even more severe epidemic, and the emergency measures employed to minimize this danger, are the subjects of the following report made by Assistant Engineer Ralph E. Irwin, who had charge of the situation.

On June 25th I received orders to go to West Reading, Berks County, to investigate the public water supply and to obtain information concerning the presence of typhoid fever within the borough and the district served by the West Reading Water Company. In the following report is set forth detailed information concerning the public water supply, general information relative to typhoid fever, and recommendations concerning the improvements necessary to place the public water supply in a safe condition. The local health authorities in consultation with the Medical Division of this Department took the necessary steps for handling the outbreak.

Location and General Conditions.

West Reading Borough is located on the west side of the Schuylkill River and opposite Reading City. A bridge on Penn Street connects the borough with Reading. A great part of the inhabitants are employed in Reading. The incorporated area covers nearly four hundred acres. The built-up section covers that part south of Penn Street from the Schuylkill River running west about half a mile. Almost as a whole the built-up section lies on a hillside with a marked slope to the east toward the river. New portions of the borough are being built north of Penn Street on the hill top and to some extent on the slope away from the river on the west, draining into Wyomissing Creek.

The present population is about 2,200. The population in 1910 was 2,064. There will probably be a steady growth. Extensive improvements in street railway connections with Reading are now in progress. The Borough of Wyomissing borders on the west. The built-up sections of the two boroughs will join in a few years, as the growth of each borough is toward the other.

The borough has no sewer system, cesspools and earthen privy vaults being in use. Many of the cesspools reach the limestone underlayer in the higher portion of the borough. The lower portion, on the hillside toward the Schuylkill River, disposes of the greater part of its sewage into cesspools sunk through ten to fifteen feet of red and yellow clay reaching beneath this stratum into sandy clay. The cesspools are usually twenty feet deep. Occasionally the cesspools become clogged and non-percolating, necessitating frequent cleaning. Brick or stone lined gutters are provided along the majority of the streets. Into these gutters is discharged a great part of the wash water and sink drainage from the kitchen. In some instances the discharge pipes from bath tubs are connected to these gutters. One of these storm drains will be described more in detail in connection with the public water supply.

Typhoid Fever.

In the following table is shown the typhoid fever record of West Reading Borough as reported by the Secretary of the local Board of Health to the State Department of Health.

WEST READING TYPHOID FEVER RECORD.

	1907	1908	1909	1910	1911	1912	1913
January,	—	1	—	0	1	0	0
February,	—	—	0	0	0	0	0
March,	—	—	0	0	0	0	0
April,	—	—	—	2	0	0	0
May,	—	—	0	5	0	0	0
June,	—	—	0	1	0	0	18
July,	—	—	0	0	0	0	1
August,	—	—	0	0	1	0	0
September,	—	—	0	0	1	4	0
October,	—	—	0	1	0	4	2
November,	0	—	0	0	0	4	0
December,	0	—	0	1	0	0	0
Total,	0	1	0	10	3	12	21

Apparently the record was not carefully kept for the first three years in the above table. The present Secretary of the local Board of Health, Dr. C. S. Reber, seems convinced that the public water supply has been the cause of nearly all of the fever cases reported from this borough and especially these occurring in 1912 and 1913. Dr. Reber says he has carefully looked into this matter and has found that the cases reported to him from his own borough may be attributed to the public water supply and that also the cases in Wyomissing Borough may be attributed to the West Reading water supply. Only a part of Wyomissing Borough is supplied by the West Reading Water Company. According to Dr. Reber it is in this part that typhoid fever occurs, there having been several cases there during

the first half of the present year and all of these cases having been consumers of the West Reading water supply. A census was not taken of the typhoid fever cases, this being in the hands of the Medical Division, but inquiry was made to learn the location of the cases so as to know approximately the number of cases in the part of the borough discharging wash water and bath water into the street gutters draining into the Schuylkill River near the intake of the West Reading Water Company. Reference to drainage from this part of the borough will be made in that part of the report dealing with the public water supply.

PUBLIC WATER SUPPLY.

General Statement.

The public water supply is furnished by the West Reading Water Company. The water works superintendent, pump station operators, and a few of the stockholders live in West Reading. The other officials and several stockholders live in Reading.

The charter under which the water company operates was granted May 17th, 1886. The water works was installed the same year. For ten years water was pumped direct from the Schuylkill River into the distributing system, the overflow going to several large wooden tanks. In 1896 a Warren filter unit was installed, and more recently two standpipes have been erected. The distributing system has been extended from year to year as desired. Water is served to a part of Wyomissing Borough as well as to the whole of West Reading.

The water works as a whole is old and inadequate. A great part of the distributing system is too small for the district served and much of it is nearly filled with sediment. Service mains recently removed were found completely filled with a deposit, principally of fine coal.

The water works at present comprises an intake from the Schuylkill River, a pump station and filter plant combined, two standpipes and the distributing system.

Intake.

The pump station is located at the foot of Chestnut Street on the east side of River Road. From the pump station a six inch suction main extends about two hundred feet east to the Schuylkill River. Penn Street bridge crosses the river about a thousand feet north of the intake. About fifty feet below the bridge an island begins, which extends south nearly in the centre of the river for approximately twelve hundred and fifty feet. This island divides the river flow, the main channel being on the east. Water flows down the west channel only during high water as gravel and sand have gathered in the west channel entrance, filling the channel above ordinary flow a distance down-stream of about one hundred and fifty to two hundred feet. Thus, about eight hundred feet up-stream from the intake the water stands stagnant for the most part, except as a small quantity flows in from springs in the bottom and sides of the channel or a small quantity seeps through the sand and gravel, filling the upper end of the channel. The intake pipe extends out into this pool about twenty feet. It is claimed by the recording secretary that a spring exists under the foot valve of the intake. This may be true, and other springs probably exist in the channel bottom. The amount of water, however, removed through the intake is much greater than that entering the channel by seepage or springs as water from the east channel rounds the lower end of the island about two hundred and fifty feet distant and flows up-stream to the intake. One hundred and twenty-five feet below the intake and on the west bank of the river a sewer discharges into the channel. This sewer carries industrial waste and waste water from the Alexander Hat Factory near at hand and also surface drainage from a considerable portion of West Reading. The discharge from this sewer, colored as it is by dye from the hat factory, is easily traced as it flows up-stream to the water works intake. The dye may often be seen also in the coagulant tank and filtered water tank at the pump station. Thus, the water supply secured by the water works is obtained almose wholly from the east channel of the Schuylkill and is contaminated within a short distance from the intake by the discharge from a sewer. The east channel water is polluted by both industrial waste and sewage from Reading.

The sewer above mentioned as entering near the water works intake is a storm sewer, mostly uncovered and carrying besides the hat factory waste, the storm water, wash water, and in some cases bath water from about two hundred dwellings in West Reading Borough. No closet drainage is known to enter, except from an occasional cesspool that may be overflowing for a short time. This drainage, however, constitutes a special danger when typhoid fever exists on this drainage area and the wash water, and possibly the bath water, is discharged by way of this sewer to the water works intake. Such was the case during the past summer. There were as many as six cases of typhoid fever at the same time in that part of the borough contributing to this sewer.

Pump Station and Filter Plant.

According to the pump station operator, the pump station was orginally a single story rectangular brick building, twenty feet by forty-five feet containing one steam

boiler and one pump. When the filter unit was installed an addition was built to the old pump house. This addition was a brick structure, a story and a half high and twenty-eight feet square. The extension in width was made on the north side of the old station. The building as it now exists contains a boiler, raw water pump, filtered water pump, filter unit, sedimentation tank, and clear water tank.

The steam boiler was built by Sotter Brothers of Pottstown and is said to be from 42 to 45 h. p. This boiler furnishes the only power available.

The raw water pump is a duplex double action Worthington, six by eight and a half by six. As usually operated it makes forty revolutions a minute. The speed of the pump is regulated by hand according to the height of the water in the sedimentation tank, which in turn is regulated by the rate of filtration. The lift from the river intake to this pump is reported to be seventeen feet. This pump, it is said, cannot pump water to the distributing system.

The filtered water pump is a single pistoned double action Guild and Garrison pump, sixteen by nine by ten. The usual rate is forty to forty-five revolutions a minute. This pump takes water from the clear water tank or from the intake line and discharges direct to the distributing system, the overflow going to either or both of the standpipes. This pump is old and apparently not in good condition.

The filter unit is of the Warren-Jewell circular wooden tub type and was installed in December 1896. It is ten feet eight inches in diameter and about ten feet deep. The filtering surface is approximately ninety square feet. Sand of a depth of about two feet rests upon a false bottom composed of a perforated copper plate supported on cross bars. The filtered water is collected in a chamber beneath the copper plate and is removed by gravity through an eight inch connection to the clear water tank. In the centre of the true and false bottom an eighteen inch flume extends up through and about two feet above the sand. Through this flume the raw water enters and distributes over the sand area during filtration and the wash water passes out this flume during the washing process. Also during washing a part of the water is collected in troughs about the inside of the filter walls and this water is carried to the centre flume. Across the top of the tank placed on timber supports is the machinery for operating the reversible rake bar agitators which are used to break up the sand when washing the unit. A small vertical engine furnishes the power for operating the rakes. The rake bars extend into the sand to within a few inches of the copper bottom.

The sand in the unit is apparently of good quality and the sand grains are in good condition. The sand bed, however, was very dirty and clogged easily. The washing process did not cleanse the sand bed. The agitation was probably sufficient but the wash water could not be removed fast enough to allow the rate of washing to be sufficiently high to carry the sediment to the sewer.

Raw and Clear Water Tanks.

In the northwestern corner of the pump station is a tank twenty-two feet by seven and seven tenths feet by eight and a quarter feet deep. A division wall divides this tank fifteen feet from the west end. The west end of the tank which is a tank of fifteen feet by seven and seven-tenths feet by eight and a quarter feet is used as a raw water tank and the east end which is seven feet by seven and seven tenths feet by eight and a quarter feet is used as a clear water tank. In the raw water tank in the southeast corner, the five inch raw water discharge main enters one and four-tenths feet from the bottom. The water flows north and then west around a baffle that extends within two and two tenths feet of the end of the tank and then into an outlet chamber. The outlet chamber is two and eight tenths feet from the southeast corner and is three and one tenth by three and two tenths feet extending from the bottom of the tank within two and four tenths feet of the top. Thus the raw water tank must be filled within two and four tenths feet of the top before water may leave for the filter. The outlet to the filter unit from this tank is an eight inch pipe two feet from the bottom. The division wall between the raw and filtered water is lower than the outside walls of the tanks so when the raw water pump discharges at a higher rate than the water passes through the filter unit the raw water passes over the division wall into the clear water tank.

The filter effluent enters the clear water tank by way of an eight inch pipe two feet from the bottom. This pipe discharges into a compartment three and seven tenth feet by two and one-tenth feet. The height of this compartment varies as the inner side is composed of an iron plate which may be raised or lowered at will. This plate is manipulated by a pulley and weight. Thus by raising and lowering this plate the head on the filter is regulated and this in turn regulates the rate of filtration. From this compartment the water discharges into the clear water tank and leaves by way of a six-inch pipe, eight-tenths of a foot from the bottom, connected with the clear water pump.

Coagulating Tanks.

Upon a loose platform over the raw water tank are two small tanks. One tank two feet in diameter and a foot and a half high is placed upon supports so that an

alum solution prepared in this tank may flow from a faucet in the bottom to the alum feeding tank which is of wooden construction three feet in diameter and two and forty-eight hundredths feet high. The feeding tank discharges into a wooden orifice box which no longer serves as a regulating device and then the solution flows through a pipe discharging at the inlet end of the raw water main.

Standpipes.

The clear water pump discharges through a six inch force main direct into the distributing system. The discharge main passes up Chestnut Street about 2,400 feet to the two standpipes on the south side of Chestnut Street between Fifth and Sixth Streets. As the force main crosses streets running at a right angle to Chestnut Street, four inch mains are connected with the discharge main and serve these streets. Each standpipe is of steel construction, seventy feet high and twenty feet in diameter. One standpipe was built in 1911, the other has been in use several years longer. Both are in good condition and clean and are usually operated together.

Distributing System.

The distributing system has been extended each year as desired. The main distributors are six inch and the laterals four inch pipe. The system undoubtedly contains a great amount of deposit. Many consumers complain of the low pressure and small flow. The pressure at the pump station is seventy-five pounds when the standpipes are full. At the time of several inspections the pressure at the pump station was about sixty-six pounds. The pressure in houses surrounding the standpipes is said to be about ten pounds or less. This is probably true as often the standpipes are nearly empty and at such times the pressure would be less than ten pounds.

According to Mr. M. A. Gring, Treasurer of the West Reading Water Company, there are 463 dwellings in West Reading, and all but one take water from the West Reading Water Company. In Wyomissing there are 150 to 200 houses supplies by the Water Company. On the north side of Penn Street near the top of the hill, is a section of undeveloped land that is now being rapidly built up. In this territory there are now fifty houses, approximately, under construction. In this district 2,000 feet of water line has recently been laid.

Operation and Efficiency.

The construction of the plant is such that proper operation is impossible. Under the best conditions the results are unsatisfactory. To solve the problem an entirely new plant should be built. The filter unit usually acts as a strainer. During flood stages the water is sometimes very low in alkalinity. At such times the alum solution used passes on through the filters as no alkali is added. Finely divided coal and clay easily pass through the sand bed. Several times coloration from dye waste was very apparent in the clear water well. The dye waste causing the color comes from the Alexander Hat Factory and is a part of the flow from the sewer which discharges a short distance below the intake and was referred to in the early part of this report. Because of poor pumping facilities it became necessary at times to bypass the filter. The record of the filter plant operator shows that the filter was bypassed and water was thus pumped direct from the river to the distributing system February 11th to 27th, 1912, and from 8 a. m., June 19th, until late in the afternoon of June 20th, 1913.

The typhoid outbreak in June started too early to be attributed to this particular instance of pumping raw water on June 19th and 20th. However, as previously stated, raw water often passes direct from the raw water tank across the division wall between the raw water tank and the clear water tank. Undoubtedly, this is a daily occurrence. It has been the custom to use alum only when the river water is very turbid and as was previously shown at such times the alum solution cannot act. When alum is not added the filter sand is washed almost daily and in this way acts as a strainer.

Emergency Measures.

On June 25th, 1913, the water company was ordered to use alum constantly and to begin at once with the use of chlorinated lime as a germicide. On the 26th of June temporary apparatus was installed and the use of chlorinated lime began. In this same apparatus alkali was added when high water occurred. The water company was also directed to make reports to this Department regarding the operation of the plant and this has been done.

On June 26th and frequently thereafter samples were collected for bacteriological analysis at the Department Laboratories. The results of these examinations were as follows:

Collected June 26—Not Treated With Germicide

		Bacteria per c.c.	B. Coli per c.c.
1.	Kitchen tap, 398 Penn Avenue,	37,500	50
2.	Kitchen tap, 90 S. Sixth Avenue,	10,500	25
3.	Kitchen tap, 323 Spruce Street,	20,000	20
4.	Kitchen tap, 10 S. Second Avenue,	18,000	30
5.	Clear water basin,	32,000	75
6.	Inlet raw water,	42,000	450
7.	Clear water basin,	27,000	0
8.	Hat factory drain,	75,000	7,500
9.	Hat factory drain,	90,000	9,750
10.	Raw water,	42,000	600
11.	Filtered water,	18,500	75

Collected July 2—Treated with Germicide after Filtration.

		Bacteria per c.c.	B. Coli per c.c.
12.	Tap, 5, Franklin Street,	10,000	4
13.	Reading Hotel,	8,000	0
14.	Clear well,	16,500	45
17.	Raw water tap of filter (untreated),	21,000	800
15.	Clear well inlet,	13,500	0
16.	Raw water inlet at tank (untreated),	20,000	800

Collected July 7—Treated with Germicide after Filtration.

		Bacteria per c.c.	B. Coli per c.c.
1.	Kitchen tap, 398 Penn Avenue,	3,000	0
2.	Kitchen tap, 625 Penn Avenue,	1,500	0
3.	Kitchen tap, 104 S. Second Street,	3,500	0
4.	Raw water at pump station (untreated),	9,000	0
5.	Filtered water at pump station,	2,400	0
6.	Filtered water at pump station,	3,500	0

Collected July 14—Treated with Germicide after Filtration.

		Bacteria per c.c.	B. Coli per c.c.
1b.	Kitchen tap, 398 Penn Avenue,	1,800	0
2b.	Kitchen tap, 625 Penn Avenue,	540	0
3b.	Kitchen tap, 100 S. Second Street,	3,600	0
4b.	Filtered water at pump station,	30	0
5b.	Filtered water at pump station,	15	0
6b.	Raw water at pump station (untreated),	6,000	0

Collected July 21—Treated with Germicide after Filtration.

		Bacteria per c.c.	B. Coli per c.c.
1c.	Kitchen tap, 398 Penn Avenue,	1,000	4
2c.	Kitchen tap, 625 Penn Avenue,	2,400	0
3c.	Kitchen tap, 100 S. Second Street,	1,800	12
4c.	Filtered water at pump station,	4,000	16
5c.	Filtered water at pump station,	3,600	24
6c.	Raw water at pump station (untreated),	10,000	540

Collected August 6—Treated With Germicide after Filtration.

		Bacteria per c.c.	B. Coli per c.c.
1d.	Kitchen tap, 398 Penn Avenue,	32,000	0
2d.	Kitchen tap, 625 Penn Avenue,	25,000	0
3d.	Kitchen tap, 100 S. Second Street,	32,000	0
4d.	Raw water tap on pump at pump station (untreated),	50,000	0
5d.	Filtered water from pump station,	40,000	0
6d.	Filtered water from pump station,	30,000	20

Collected September 22—Treated with Germicide after Filtration.

	Bacteria per c.c.	B. Coli per c.c.
1. Raw water (untreated),	6,000	1,000
2. Sedimentation basin,	3,000	210
3. Tap, pumping station,	2,000	150
4. Penn Street Hotel, tap,	600	36
5. Tap, Res. of E. Welder, 437 Chestnut Street,	1,800	120

Collected December 1—Treated with Germicide after Filtration.

	Bacteria per c.c.	B. Coli per c.c.
1. Raw water (untreated),	1,200	0
2. Tap from pump,	1,000	0
3. Tap, Penn Street Hotel,	150	0
4. Tap, West Reading Hotel,	140	0
5. Tap, 322 Chestnut Street,	120	0

From the above results it will be noted the raw water is highly polluted and that this pollution is but slightly decreased by passing the water through the filter plant. The treatment of the water with chlorinated lime has been very unsatisfactory. On June 25th, the local Boards of Health of West Reading and Wyomissing, directed the consumers of the West Reading Water Company's supply to boil all water used for domestic purposes. At that time typhoid fever was prevalent in this section and it is believed that this warning was heeded and accounts to a considerable degree for the low typhoid rate thereafter.

Steps Toward Permanent Improvements.

Following my oral report on June 27th, the following communications were sent to E. Carroll Schaeffer, Secretary West Reading Water Company, G. W. Alexander & Company, owners and operators of the Alexander hat factory, the Burgess and Town Council of West Reading, and Dr. C. S. Reber:—

"June 27, 1913.

"Burgess and Town Council,
West Reading, Pa.

" Gentlemen:—

"Drainage from the borough and hat factory is still being discharged into the Schuylkill River a short distance below the intake of the West Reading Water Company. This drainage endangers all those using the public water supply and especially is this true at the present time when typhoid fever exists in that part of the borough from which kitchen waste and wash water is discharged into the river.

"You should advise and co-operate with the West Reading Water Company and G. W. Alexander & Co., that in some way the discharge of this drainage may be removed to a point further down the stream where it will be impossible for the drainage to backflow to the water works intake.

"The West Reading Water Company and G. W. Alexander & Co., are being advised concerning this matter.

"Yours very truly,

"SAMUEL G. DIXON."

"June 27, 1913.

"Dr. C. S. Reber, Pres.,
Board of Health,
West Reading, Pa.

"Dear Doctor:—

"I am herewith enclosing copies of letters being sent to the West Reading Water Company, the Burgess and Town Council, and to G. W. Alexander & Company. I am giving you this information that your Board may use its influence in bringing about the betterment of existing conditions . The opening of the channel by the water company is not sufficient, but the drainage should be carried to a point further down stream so that backflow to the intake will be impossible. The cost of this improvement will not be great and it appears to be negligence on the part of the borough that the outlet of the drain was ever removed up the river to its present position. It is hoped that your Board will use its influence to have this matter adjusted not later than the coming council meeting held July 1st.

"The Department stands ready to assist in this matter in any way possible. The water company is ready to make improvements as required by the Department, but it does not seem just that the company should be required to correct errors due to the negligence of the local authorities and the hat factory.

"Yours very truly,

"SAMUEL G. DIXON."

"June 27, 1913.

"G. W. Alexander & Co.,
Reading, Pa.

"Gentlemen:—

"It is important that some immediate action should be taken to remove the discharge of drainage from your manufacturing plant and the borough to a point down stream from which it will be impossible for the drainage to backflow to the intake of the West Reading Water Company. You should therefore advise at once with the borough authorities and the West Reading Water Company to bring about this improvement. It is important that action should be taken at once or I will be compelled to place the matter in the hands of the Attorney General for adjustment.

"Yours very truly,

"SAMUEL G. DIXON."

"June 27, 1913.

"Mr. E. Carroll Schaeffer, Sec.,
West Reading Water Company,
524 Washington Street,
Reading, Pa.

"Dear Sir:—

"The source from which you obtain your water supply is an unsatisfactory one. You are aware of this fact and it should be necessary for me to simply call attention to improvements perhaps already contemplated, but which should be made at once.

"The river channel on your side of the island should be opened so that water would pass down over the pumping station intake and thus prevent any backflow reaching the intake.

"You should advise and co-operate with the borough authorities and the officials of the Alexander hat factory that in some way the drainage now entering the river a short distance below your intake may be carried to a safe point down stream.

"Existing conditions render the water difficult to purify. Because of this you should use additional precautions. Coagulant should be used constantly It may be necessary to use a germicide. An Engineer from this Department will advise with you concerning the operation of your filter plant. To assist the Department in its efforts you should keep records of daily operation and submit copy of such records weekly.

"Yours very truly,

"SAMUEL G. DIXON."

On July 3rd, the Borough Council, the local Board of Health, and G. W. Alexander & Co., held a meeting. The Water Company had no representative present. This meeting resulted in the sending of a communication to the Water Company asking that the drainage from the sewer be carried to a point far enough down stream to prevent it entering the water works intake. Neither the Borough nor G. W. Alexander & Co. assumed any responsibility.

During the year 1910 the Water Company had constructed a thirty inch iron outfall pipe along the bank of the river leading from the junction of the sewer with the river, to a point about 240 feet below. At this point the fall of the river is sufficient to prevent waste discharged here from being carried back to the water works intake. This pipe line was in use a very short time as it filled with sediment and was not cleaned out. The sewage then discharged into the stream as before. During the fall of 1913 the Water Company had about a twelve inch section cut from the top of this thirty inch iron pipe and throughout its entire length. Through this opening the deposit in the pipe line was removed. A connection was made with the sewer and since that time this pipe line has carried sewage a safe distance below the water works intake. This, of course, is but a temporary improvement.

It would seem that the borough should asume the responsibility of properly disposing of the discharge from its sewers. The borough has been negligent in this matter. The negligence of the borough, however, does not relieve the Water Company of its responsibility.

On November 19th, 1913, the following communication was sent to the West Reading Water Company through its Secretary, E. Carroll Schaeffer.

"November 19, 1913.

"Mr. E. Carroll Schaeffer, Sec.,
West Reading Water Company,
524 Washington Street,
Reading, Pa.

"Dear Sir:—

"Beg to acknowledge receipt of your favor of November 13th regarding the operation of your waterworks.

"It becomes my duty in the interest of the public health to notify and require you to forthwith engage the services of an engineer experienced in the treatment of water to undertake the responsible supervision of your water works in West Reading and establish its operation in a manner so as not to be prejudicial to public health. Emergency measures may be used immediately such as the use of chemical germicides and the cleansing of pipes, etc.

"The equipment at your pumping and filtration plant is inadequate. You are therefore, hereby ordered and required, in order that your company may fulfill its obligations to the public, to have prepared and submit to this Department on or before February 1st, 1914, plans and specifications and a report for a pure and adequate source of supply and to be prepared to at once undertake the execution of the proposed plans after they are modified, amended or approved by this Department.

"Yours very truly,

"SAMUEL G. DIXON."

On November 21st, 1913, the Secretary of the Water Company replied that the letter of November 19th had been duly received and would be submitted to the Board of Directors of the Company. It is reported that permanent improvements will be consummated the coming year.

32. TYPHOID FEVER AT WRIGHTSVILLE.

During the fall of 1913, an outbreak of typhoid fever occurred in the Borough of Wrightsville, York County. There were thirty-one cases of the disease. All but one were attributed to the use of water from the Big Spring, so called, and individual wells. Assistant Engineer, William C. Riddle was assigned to make the investigation and the following is his report:

During August, September, and October, an outbreak of typhoid fever occurred in the borough of Wrightsville, York County. This outbreak was investigated by the writer at intervals from October 16th to November 8, 1913.

The Borough of Wrightsville is a manufacturing community of 2,100 inhabitants located in the eastern part of York County on the west bank of the Susquehnna River. In 1900 the population was 2,266 and in 1890, 1,912. The town was laid out in 1811 and incorporated as a borough in 1834. The Frederick Branch of the Central Division of the Pennsylvania Railroad passes through Wrightsville connecting it with the cities of York and Lancaster and the Borough of Columbia. The latter town is on the opposite side of the river from Wrightsville and the two towns are connected by a combined railroad and highway bridge. An inter-urban electric line extends between Wrightsville and York. Through the town near the river in an easterly and westerly direction extends the McCalls Ferry and Power Company's canal which has not been in use since 1899. Hellam Township entirely surrounds Wrightsville, except for the small river front.

Wrightsville is in a fertile farming valley of limestone formation. Hellam, the main street, extends due east and west through the borough, the drainage area sloping to the north toward the river and to the south toward Creitz Creek. The manufactories include the Riverside Foundry Co., the Susquehanna Casting Co., the Wrightsville Hardware and Foundry Company and several smaller establishments of various character. The town is electrically lighted, current being furnished by a private company. This plant and most of the factories are located along the river bank and have either permanent intakes from the river or temporary arrangements to use it as a source of supply for boiler and industrial purposes when the public supply in the town fails.

Three-fourth of the population in the borough obtains a water supply for domestic purposes from private sources. The largest of these by far is known as the Big Spring located at the corner of Second and Walnut Streets in the low lying portion of the town, one block from the river. Water therefrom is supplied direct to a half dozen houses and the overflow is used by over 500 persons, either wholly or in part, the water being carried to the various houses. There are about a hundred wells in the borough in the limestone formation. The greater majority are dug. There are about a dozen neighborhood wells along the public streets, the water from which is used by the occupants of from one to fifteen properties. Rain water cisterns are also used on account of the hardness of the ground water.

Sewage is disposed of in common privy vaults, cess-pools, crevices in the limestone and in a few instances by private sewers to the river. There are a number

of storm water drains but these receive little or no sewage or waste water. Although the close proximity of the privies, cess-pools, and wells renders the latter suspicious sources of water supply for domestic purposes, it is reported that up to the present time there has been little typhoid fever in Wrightsville.

Water Works System.

The Wrightsville Water Supply Company was incorporated June 16th, 1897, for the supply of water to the public in the Borough of Wrightsville. The supply is obtained from springs along the course of a small tributary of Creitz Creek at a point about one mile southwest of the borough and at times from the small run itself. An additional supply is obtained during drouths from six drilled wells sunk during the years 1911 and 1912, in the vicinity of the storage and distributing reservoirs.

On November 10, 1909, in response to an application for permission to obtain an additional source of water supply from Jacobs stream, a permit was issued to the Wrightsville Water Supply Company In this permit a complete description of the source of supply and water works system was set forth at length and the following description of the existing system will therefore be brief.

Creitz Creek rises eight miles southwest of Wrightsville, follows a winding course through a farming territory and flows easterly through the southern part of Wrightsville Borough to its confluence with the Susquehanna River. The tributary of Creitz Creek along which the springs are located and from which a supply is at times obtained, enters Creitz Creek from the south. On the west bank of the run is a concrete reservoir having a capacity of 200,000 gallons. An overflow weir five feet long is provided at the side toward the run at the lower end and a drain pipe for flushing is also installed at the lower end. About a hundred feet above the reservoir is an old masonry breast extending across the ravine. The reservoir it forms was the original source of supply but it has been abandoned and the pipes disconnected from the existing water works. The spillway was at the eastern end of this dam. Stones have been removed from the spillway so that there is a notch in its center. The course of the run below the spillway is along the eastern side of the concrete reservoir.

Along the western side of the reservoir there is a ditch which has been constructed for by-passing the storm water from the hillside above, which consists of about thirty acres of open farm land having steep slopes toward the reservoir. This ditch fills up rapidly and during excessively heavy run-offs storm water overflows into the basin carrying surface scourings with it. Furthermore, the waste way channel below the old abandoned reservoir is insufficient and during heavy storms surface water overflows into the reservoir. This occurred at least twice during the summer of 1913.

The main supply consists of two springs known as No. 1 and No. 2. The former is by far the larger. Spring No. 1 is located four hundred feet up the eastern ravine above the reservoir. It is closed by a concrete structure about four feet square, open at the top and covered by a wire screen. About fifty feet down the run on the same bank is a concrete intake enclosure also covered with a wire screen. From it a masonry breast extends across the channel of the run. The intake enclosure receives the flow from the spring mentioned through a four inch pipe and also at times the flow from a spring in the bank close to it through a six inch pipe. A grated opening provided with a wooden sluice gate affords access to the intake box for the water in the pond. A four inch pipe line rises vertically in the bottom of the intake chamber to within a few inches of the elevation of the adjacent dam and connects with a six inch supply line leading to the reservoir. A plug is inserted in this four inch supply line when it is desired to shut off this supply. At the time of the Department's recent investigation the sluice gate was closed but water from the stream was leaking through the sides and passing through one inch holes bored through the sluice gate near the bottom.

The drainage area above the dam comprises about a hundred acres of farm land with steep slopes. There is one property on the shed and a private road extends up the ravine. On the property on the shed, water is piped from a spring to a barn yard trough and the overflow carries barn-yard drainage back to the stream so that even during normal weather conditions there is a certain amount of barnyard drainage to the run.

It is reported by the water company officials that the sluice gate is closed during rains.

Spring No. 2 is about two hundred feet above the old reservoir at the foot of the western slope of the west ravine. The spring forms a small pond, dammed by a semi-circular wall. The pond receives the run off from the hillside above it and some of the water from the small run especially during storms. At the foot of the hillside is a concrete intake box covered with a wire screen and provided with a wooden sluice gate. This sluice gate is supposed to be closed during rains, but it is not tight and, even when closed, surface drainage may enter the intake box. The outlet pipe from the intake box rises vertically from the bottom to within a few inches of the elevation of the waste weir and connects with a six inch supply line which joins the line leading from Spring No. 1. Below the junction the pipe passes around the western side of the old water works ponds and ex-

tends through the top of the reservoir wall at its southwestern corner. The drainage area tributary to the ravine above the spring No. 2 comprises about a hundred acres and is similar in character to that above spring No. 1. A public road extends up the ravine and there is one farmstead about a quarter of a mile above the spring. It is possible that drainage from a pig-pen on this property may enter the spring. A shallow dug privy vault is located about fifteen feet from the stream and continues to be a menace to the purity of the waters therein. Stray cattle have at times wandered on the very edge of the pond and there is no guard to keep them from getting into the water.

The outlet pipe from the reservoir rises about a foot above the bottom. It is ten inches in diameter to a point a few feet from the reservoir and is provided with a shut off valve. The gravity main is eight inches in diameter. The distributing system in Wrightsville is said to consist of about five miles of six and four inch pipe. There are fire hydrants connected to the system and flush outs along the river, so it is reported. During the drouths of the past few years, the supply has proved entirely inadequate. At the time of the Department's recent investigation there were only about six inches of water in the reservoir. At such times no fire protection whatever is afforded.

On October 17th, 1913, the water company officials were communicated with and instructed to install a temporary hypochlorite of lime treatment plant for the treatment of all water supplied to the public. On October 18th, the plant was installed. The apparatus is crude and can be considered only as a very temporary precaution. It is located immediately above the reservoir and consists of a mixing barrel and a half barrel provided with a float valve. The apparatus was placed on the ground surface and the chemical solution drips directly into the funnel placed in the six inch gravity main leading to the reservoir.

No shelter is provided and the plant does not receive the attention it should in order to produce satisfactory results. At the time it was installed the flood gates were closed and the flow into the reservoir at this point was approximately 43,000 gallons for twenty-four hours. As the lime had a contact period with the water before entering the reservoir of but one or two seconds it was decided to dose the flow from the drilled wells, which is delivered direct to the reservoir. On the basis that the total supply from both sources is approximately 60,000 gallons in twenty-four hours, it was decided to use half a pound of lime each twenty-four hours, which would be approximately one part of lime to one million parts of water.

Samples collected at times from various portions of the water works system and analyzed bacteriologically showed the water to be dangerous. The results of the analyses are as follows:

		Bacteria per c. c.	B. Coli per c. c.
October 6,	Tap from reservoir,	130	3
October 16,	Reservoir,	100	1
	Spring No. 1,	9	0
	Spring No. 2,	120	2
	Arthur Hill tap,	160	0

On October 27th, 1913, the following communication was sent to the water company:

"Wrightsville Water Supply Co.,
"622 Court Street,
"Reading, Penna.

"Gentlemen:—

"This is to notify and require you to forthwith install and maintain at your reservoir for the treatment of the water with a chemical germicide an up-to-date apparatus of first class engineering design so protected that it can be kept in operation throughout the winter until an adequate permanent supply of water not prejudical to public health is obtained in accordance with plans to be submitted to and approved by this Department. This chemical plant shall be made satisfactory to the State Department of Health and is to replace the present emergency installation. The water company shall forthwith seal substantially with cement concrete the openings in the spring enclosures above the reservoir so as to positively exclude all surface water. If any emergency inlet for surface water is to be made at these enclosures, it shall be by means of metallic gate valves of approved design so that the flow can be regulated and the chemical apparatus adjusted accordingly.

"Regarding the Creitz Creek proposition, there is no information before the Department to show that a plant can not be designed to suitably purify this source of supply.

"Very truly yours,

"Samuel G. Dixon."

During the past few years the Wrightsville Water Supply Company has been furnishing a supply of water unsatisfactory both in quantity and quality to the inhabitants of Wrightsville Borough. In April 1913 suit was brought by residents against the water company in the court of Common Pleas of York County with the result that the court handed down the following order:

"IN THE COURT OF COMMON PLEAS OF YORK COUNTY,
PENNSYLVANIA.
SITTING IN EQUITY.

Henry McElroy, Chief Burgess of Wrightsville Borough, York County, Pennsylvania, W. W. Drenning and E. A. Waltman, of the Borough of Wrightsville, Pennsylvania, Plaintiffs.

vs.

Wrightsville Water Supply Company, Defendant.

No. 1. August Term 1913.

"And now, to wit: Sept. 30, 1913, this case came on to be heard and by agreement of Henry C. Niles, Solicitor for Plaintiffs, and W. F Bay Stewart, Solicitor for Defendant, it is ordered, adjudged and decreed:

"1st. That the Defendant Company be, and is hereby ordered, required and decreed to furnish to the Borough of Wrightsville, the Plaintiffs, and other citizens of said Wrightsville Borough using the water of defendant, a sufficient supply of reasonably pure and wholesome water.

"2nd. That unless the said defendant shall furnish to the Borough of Wrightsville, the Plaintiffs, and other citizens of said Wrightsville Borough using the waters of Defendant, a sufficient supply of reasonably pure and wholesome water, on or before July 1st, 1914, all of the prayers of the bill filed by the Plaintiffs will be granted, unless the respondents shall have made a bona fide effort to provide such adequate supply of reasonably pure and wholesome water; and if the said respondent shall have made such effort, and for any cause beyond Defendant's control, shall not have succeeded in completing the necessary work, then the said case shall be continued and such additional time may be allowed to complete the improvement of the plant so as to accomplish the purpose of the first decree herein as the court in its judgment shall deem fair and sufficient.

"Excepting as to above decrees the case shall be held open for the future action, orders and decrees of the court."

Milk Supply.

There are but two dealers supplying milk in Wrightsville namely: J. D Drenning and Haugh & Kline.

J. D. Drenning is the larger dealer, furnishing on an average of 350 quarts daily. Two delivery wagons are used, one for the bottle trade serving about one hundred customers and one for the can trade supplying two hundred customers. Milk is purchased by and delivered to the Drenning milk depot in Wrightsville from seven farms all located in Hellam Township, within three miles of Wrightsville. The dealers are as follows:

Tenant.	Owner.	Address.
Mrs. Arthur Able, (Jessop Farm J. L. Jessop),	Mrs. Anna Huber,	York.
A. E. Strickler,	Wilton Cook,	Wrightsville, R. D.
W. G. Wallick,	Jas. Stoner,	Hallam.
Geo. Cohn,	Harris Keesey,	York.
Frank Wambaugh,	A. B. Sprenkle,	Wrightsville.
Albert Hilt,	Mrs. David Cook,	York.
H. E. Keller,	Dietz Est.,	Hallam.

The Jessop farm is the largest, 200 pounds of milk a day from fifteen cows being the output. There are two properties on the farm, one occupied by Mr. Jessop and the other by the tenant Mrs. Arthur Able. The tenant house is located 150 feet from the barn and Mr. Jessop's house 300 feet distant. Mrs. Able has charge of the milking. The water for washing the cans is obtained from a rain water cistern. The cans are scalded and the attendant is careful and cleanly. The stable is in a good condition, well ventilated, and the cows are kept clean. After milking the milk is poured into cans which are covered and placed in a water trough to cool. Each day the milk is delivered to Drenning in Wrightsville.

In August 1912, there was a case of typhoid fever in the Jessop house. The patient, Blair Jessop was eleven years old and attended school in Wrightsville. She had nothing to do with the milking. A trained nurse was employed and carbolic acid and lime used on clothes, hands, and in the sick room and on the stools which were buried. Water at the Jessop house was obtained from a dug well. It is not adequately protected against surface drainage. Water therefrom was used for household purposes. The results of analyses of samples collected on September 3rd, 1913, from the well, reservoir, and rain water cistern are as follows:

Sample Number.	Source.	Bacteria per c. c.	B. Coli per c. c.
No. 1	Well,	1,000	100
No. 2	Well,	1,500	2
No. 3	Cistern reservoir,	800	150
No. 4	Reservoir,	600	24
No. 5	House cistern (contains raw water used for washing, etc.),	540	2

These samples were collected by Dr. Hoover of Wrightsville and it is reported by Mr. Jessop that the use of water for domestic and culinary purposes without being boiled has been discontinued.

On October 24th, 1913, the following letters were sent to the owner and tenant of the property:

"Mrs. Anna Huber,
"York, Penna.

"Dear Madam:—

"The water from the dug well on the farm owned by you and tenanted by Mr. J. L. Jessop, located in Hellam Township, near Wrightsville, is laden with sewage organisms and a constant menace to the health of the people using the same. The well should either be abandoned or thoroughly cleaned out. If this latter course is pursued the water used in the meantime should be boiled for at least twenty minutes before being used for domestic or culinary purposes. After the well is cleaned the water should be analyzed to determine whether or not the source of pollution has been removed. Furthermore, the well should be adequately protected against surface drainage and provided with a tight cover.

"The rain water cistern is in poor condition. It should be thoroughly cleaned out, if the water therefrom is to be used, and provided with a tight cover. There is danger in its present condition, in the use of water therefrom for drinking purposes and for washing milk cans.

"Yours very truly,
"Samuel G. Dixon."

"Mr. J. L. Jessop,
"Wrightsville, Pa.

"Dear Sir:—

"As you are aware the water from the dug well on the farm owned by Mrs. Anna Huber and tenanted by you is laden with sewage organisms. The well should either be abandoned or thoroughly cleaned out. If this latter course is pursued the water used in the meantime should be boiled for at least twenty minutes before being used for domestic or culinary purposes. After the well is cleaned the water should be analyzed to determine whether or not the source of pollution has been removed.

Furthermore the well should be adequately protected against surface drainage and provided with a tight cover.

"The rain water cistern is in poor condition. It should be thoroughly cleaned out, if the water therefrom is to be used, and provided with a tight cover. There is danger in its present condition, in the use of water therefrom for drinking purposes and for washing milk cans. A letter similar to this is being forwarded to Mrs. Anna Huber.

"Yours very truly,
"Samuel G. Dixon."

Conditions on the Wilton Cook farm were good. The stable was well ventilated and the floor, mangers, and cows were clean. No milk is stored, it being delivered each day to Drenning. The milk utensils are scalded and when filled placed in a spring to cool. Water for domestic use is obtained from a spring and well both of which are adequately protected against surface drainage. There are fifteen cows on the farm and the amount of milk averages 200 pounds a day. It is said that no typhoid fever has ever been present on the premises.

The Jas. Stoner farm supplies 100 pounds of milk a day, this being the output of nine cows. The entire stable was in a sanitary condition, the cows were clean and the attendants cleanly. Immediately after milking, the milk is placed in covered cans and stored over night in a spring house. Each morning it is delivered to Drenning in Wrightsville. Water for all purposes is obtained from a spring. The utensils and milk cans are scalded and aired out doors. It is said that there has never been a case of typhoid fever on the farm.

At the Harris Keesey farm the physical conditions were excellent. The stable throughout was sanitary and the cows clean. After milking in the evening the cans are placed in a spring house until morning when it is delivered to Drenning. The cans are washed in boiling water, dried, and aired in the open. No typhoid fever has ever been present on the farm. The spring in which the cans are placed is well protected as is also the well at the farm house, the water from which is used for domestic purposes. The cows number eight and the amount of milk averages about fifty pounds a day.

Conditions at the A. B. Sprenkle farm are also good. The stable is clean, well ventilated and lighted. The mangers and cows are clean. The attendants appear to be careful and cleanly. The buckets in which the milking is done are immediately covered with cloth, removed from the stable and the contents thereof poured into cans. Water from a well protected against surface drainage is used for all purposes. The cans are scalded and all necessary precautions appear to be taken. There are six cows on the farm, the daily amount of milk is about twenty-five pounds. It is said that there has never been a case of water-borne disease on the premises.

At the David Cook farm the stable is clean with the exception of cob-webs, the ventilation is good. The mangers, walls, and floor are clean and the cows appear to be in good condition and receive careful attention. Milk is poured from buckets directly into cans which are placed in a spring house. All utensils are washed with hot water. The cows number ten, the milk averages fifty pounds a day. It is said that no typhoid fever has ever been present. A verbal notice was given thoroughly to clean the stable.

Conditions at the Dietz Estate farm are excellent. The stable is well ventilated, lighted, and white-washed. The cows are kept clean, and the attendants are above the average in intelligence. All water is obtained from a dug well which appears to be adequately protected. The cans and utensils are boiled and aired. The cows number twelve and the amount of milk six gallons a day. No typhoid fever has occurred on the farm, it is said. All the milk from the above farms is delivered daily to the J. D. Drenning milk depot on Hellam Street in Wrightsville. The milk is first weighed and then transferred to the heating vat where the temperature is raised to 150 degrees Fahrenheit. From this vat the milk passes to a separator where the animal and foreign matter is removed, thence to an aerator where the temperature is reduced to 54 degrees Fahrenheit. Double sieve strainers through which the milk passes are installed in the weighing cans, heating vats, strainers and in the aerator. The milk is then bottled by machinery. It is said that all the operations conform with the Pure Food laws. The bottles are boiled in a trough, sal soda being used. They are mechanically washed, rinsed, and drained. The premises are reported to be in a sanitary condition.

Haugh and Kline, the other firm serving milk in Wrightsville, obtain the supply from four farms all located in Hellam Township within two miles of Wrightsville. The owners and tenants of these farms are as follows:

Tenant.	Owner.	Address.
Millard Poff,	Jas. Strickler,	Wrightsville.
Wm. Hilt,	Jas. Strickler,	Wrightsville, R. F. D.
Henry Smith,	Wm. H. Flora,	Wrightsville.
Haugh & Kline,	Haugh & Kline,	Wrightsville, R. F. D.

These dealers serve 160 consumers and the amount of milk sold averages from forty-five to fifty gallons a day. Of this amount from sixty-five to seventy-five per cent. is sold from cans and the balance in bottles. The milk is delivered from the Haugh and Kline farm by Mr. Kline who collects from the Strickler and Hilt farms on his way to town. The milk from the Flora farm is brought daily to Haugh and Kline.

At the Strickler farm the existing conditions from a sanitary standpoint in so far as the dairy is concerned were excellent. The stable throughout, the cows, barnyard, and attendants were clean. Directly after milking the milk is poured into covered cans which are placed in a watering trough, used only for this purpose, and are collected in the morning by Mr. Kline. All utensils and cans are washed in hot water and aired out doors. The cows number fifteen and the milk averages 150 pounds a day.

During July, 1913, there was a case of typhoid fever on the farm, the patient Verna Poff, age fifteen, attended Patrick's school in York, returning home over Sunday. She had nothing whatever to do with the care of the milk. The stools were carefully disinfected with carbolic acid and lime and disposed of in a cesspool. This cesspool is about twenty-five feet from a dug well from which water for all purposes is obtained. The ground slopes from the well toward the cesspool. The patient was nursed by her mother who carefully disinfected her hands and all utensils. She nevertheless superintended the milking. The sick room was screened. A sample of the water from the dug well was analyzed at the Department laboratory on October 22nd, the results being as follows:

	Bacteria per c. c.	B. Coli per c. c.
Dug well, Poff Farm,.....	300	0

The conditions at the Hilt farm were generally satisfactory, the stable was clean and white-washed, but cob-webs covered the ceiling. The barnyard was in a good condition. A stream of water flows through the farm in which the cattle wade. All cans and utensils are boiled, water being obtained from a dug well located at the house. Over night the cans are placed in a spring house. There are but two cows on the farm. No typhoid fever has ever occurred, so it is said.

The Flora farm is well kept up. The barnyard and the stable throughout are sanitary with the exception of cob-webs. The cows are healthy looking and clean as well as the attendants. Water for all purposes is obtained from a ninety-five foot drilled well cased to rock. The well is located ten feet distant from the barnyard and the water is either pumped by hand or by a gasoline engine to the watering trough which is near, and to the farm house. This supply is used for all purposes and is said to be obtained from a gravel and slate formation. There are eight cows on the premises and the milk is delivered each day to the Haugh and Kline farm. The milk is placed in cans after milking and the cans are boiled and aired daily. No typhoid fever has ever occurred on the premises.

The Haugh and Kline farm has been tenanted by Mr. Kline for less than a year. The barn is in good condition although not too well lighted and ventilated. Cob-webs are on the ceiling. Mr. Kline is, however, now engaged in placing the barn in better condition. He intends to put in a concrete floor and make it modern in every respect. The stock numbering five, were well kept and the attendants cleanly. Water for all purposes is obtained from a drilled well 105 feet deep, cased to rock and pumped to the barn and house by means of a gasoline engine. The bottling room in the basement of the house is scrupulously clean. The cans and bottles are boiled each day. Any milk left over is separated and churned into butter. It is reported that there has never been a case of typhoid fever on the estate.

Typhoid Fever Outbreak.

Investigation has shown that the reports of typhoid fever cases during the past few years from the local Board of Health to the Department are incomplete and inaccurate. Although typhoid fever has never before been epidemic, the cases have been more frequent than the table below indicates.

Monthly and Yearly Typhoid Fever Cases.

Compiled from Reports to the State.

Month.	1905	1906	1907	1908	1909	1910	1911	1912	1913
January,	.....	2	—	0	0	0	0	1	0
February,	.....	0	—	0	0	0	0	0	0
March,	.....	—	—	0	0	0	1	0	0
April,	.....	—	—	0	0	0	0	0	0
May,	.....	—	—	0	0	0	0	0	0
June,	.....	—	—	0	0	—	0	0	0
July,	.....	—	—	0	1	—	0	0	0
August,	.....	—	—	0	0	—	0	0	1
September,	.....	—	0	1	0	—	0	0	4
October,	—	—	0	0	0	1	0	1	16
November,	—	—	0	0	0	0	0	0	1
December,	1	—	0	0	0	0	1	1	0
Total,	1	2	0	1	1	1	2	3	22

0 =No cases.
— =No report.

The investigation conducted by the Department extended at intervals from Oct 16th to Nov. 8th inclusive. During this time a census was made of all the cases occurring during August, September, October. In all thirty-one cases were investigated. Detailed data have been secured concerning all these cases and from this information the conclusions arrived at as to the cause of the outbreak have been deduced. The following table shows in detail the pertinent facts collected concerning each of the thirty-one cases.

CASES OF TYPHOID FEVER AT WRIGHTSVILLE.

Number.	Patient.	Address	Age.	Sex.	Married or single.	Occupation.	Name of Employer or School.	Address.	Date First Feeling Sick.	Date of First Visit.	Nurse.	Total population of house.	Number of other cases in house.
1	M. B., ...	420 Locust, ...	24	F.	S.	Home, ...	.....	.....	August 5, ...	August 12, ...	Ethel Dorsey, Nettie Lehrer and O. Gochneour, ...	3	0
2	H. C. S.,	Fifth & Walnut, ..	25	M.	M.	Moulder, ..	Riverside Foundry Co.	Wrightsville,	August 25, ...	August 30, ...	Wife, ...	5	0
3	L. S., ...	250 N. Front, ...	21	M.	S.	Stenog., ..	Farmers Ins. Co.,	York, ...	September 1,	September 8,	Mother, ...	6	1
4	O. McC., ..	Locust & Second,	16	M.	S.	Moulder, ..	Wrightsville Hardware and Foundry Co.	Wrightsville,	September 1,	September 13,	Mother, ...	4	1
5	W. B. F.,	Hellam abv. 2nd,	7	M.	S.	Student, ..	Public School, ..	Wrightsville,	September 11,	September 18,	Miss Eckert, Lancaster.	5	0
6	L. D., ...	Hellam bel. 2nd,	43	F.	M.	Hsewife.,	.....	.....	September 13,	September 25,	Hospital, ...	5	0
7	G. H., ...	Third & Walnut, ..	23	M.	S.	Moulder, ..	Susquehanna Casting Co.	Wrightsville,	September 16,	September 19,	Mother, ...	9	0
8	A. C. H.,	Locust & Second, ..	9	F.	S.	Student, ..	Public School,....	Wrightsville,	September 20,	September 25,	Mother, ...	5	0
9	M. S. N.,	314 Walnut St., ..	8	M.	S.	Student, ..	Public School,....	Wrightsville,	September 21,	September 23,	Mother, ...	8	0
10	H. W., ...	Third & Walnut, ..	16	M.	S.	Moulder, ..	Susquehanna Casting Co.	Wrightsville,	September 25,	October 6, ...	Mother, ...	6	0
11	W. L. P.,	Third & Hellam, ..	21	M.	S.	Stenog., ..	Pullman Auto Co.	York, ...	September 25,	September 27,	Mother, ...	5	0
12	C. McC.,...	Fifth & Walnut, ..	5	F.	S.	At home,	.....	.....	September 26,	October 1, ...	Mother, ...	5	0
13	A. C., ...	Willow nr. Second,	35	M.	M.	Moulder, ..	Susquehanna Casting Co.	Wrightsville,	October 1, ...	October 2, ...	Hospital, ...	4	0
14	H. F., ...	Lemon nr. Front, ..	19	F.	S.	Stenog., ..	Star Printing Office.	Wrightsville,	October 1, ...	October 2, ...	Mother, ...	6	0
15	W. McE.,..	Second & Walnut,..	19	M.	S.	Machinist,	U. S. Lock Co.,...	Columbia, ...	October 2, ...	October 4, ...	Mother, ...	5	1
16	Wm. M.,...	Walnut & Front, ...	9	M.	S.	Student, ..	Public School, ..	Wrightsville,	October 2, ...	October 5, ...	Mother, ...	8	1
17	C. H., ...	230 Locust, ...	12	F.	S.	Student, ..	Public School, ..	Wrightsville,	October 4, ...	October 12. ...	Mother, ...	5	0
18	E. M., ...	Walnut & Front, ..	31	M.	M.	Moulder, ..	Susquehanna Casting Co.	Wrightsville,	October 4, ...	October 5, ...	Wife, ...	8	1
19	N. S., ...	215 N. Front, ...	13	M.	S.	Student, ..	Public School, ..	Wrightsville,	October 5, ...	October 8, ...	Mother, ...	6	1
20	M. H., ...	Walnut bet. 4 & 5,	18	M.	S.	Laborer, ..	Riverside Foundry Co.	Wrightsville,	October 5, ...	October 17, ...	Mother, ...	3	0
21	M. McE.,..	Second & Walnut,	16	F.	S.	At home,	.....	.....	October 6, ...	October 13, ...	Mother, ...	5	1

22	M. M. S.,	Locust & Front, ..	26	F.	S.	Clerk, ...	Huntberger Store,	Wrightsville,	October 8, ...	October 10, ...	Mother, ...	5	0
23	Wm. H.,...	Walnut nr. Third,	25	M.	M.	Moulder, ..	Susquehanna Casting Co.	Wrightsville,	October 7, ...	October 11, ...	Wife, ...	2	0
24	B. E., ...	313 Walnut, ...	11	F.	S.	Student, ..	Public School, ..	Wrightsville,	October 11, ...	October 17, ...	Mother, ...	5	0
25	Mrs. V. S.,	Front & Locust, ..	20	F.	M.	Housewife.,	.....	.....	October 11, ...	October 20, ...	Marg. Sprenkle, ..	6	0
26	C. K., ...	Third & Walnut, ..	22	M.	M.	Moulder, ..	Susquehanna Casting Co.	Wrightsville,	October 15, ...	October 19, ...	Wife, ...	4	0
27	M. W., ...	Second & Walnut,	23	M.	M.	Laborer, ..	Riverside Foundry Co.	Wrightsville,	October 16, ...	October 17, ...	Hospital, ...	3	0
28	M. McC.,...	Locust & Second, ..	12	F.	S.	Student, ..	Public School, ..	Wrightsville,	October 18, ...	October 22, ...	Mother, ...	4	1
29	B. M., ...	Garden Al. nb. 2nd,	7	F.	S.	Student, ..	Public School, ..	Wrightsville,	October 19, ...	October 27, ...	Mother, ...	5	0
30	J. L., ...	Locust nb. 2nd, ..	46	M.	M.	Laborer, ..	Susquehanna Casting Co.	Wrightsville,	October 20, ...	October 24, ...	Wife, ...	4	0
31	Wm. H.,...	Maple bet. 2nd, ..	53	M.	M.	Laborer, ..	Miscellaneous work about town.	Wrightsville,	October 26,....	November 2 ..	Wife, ...	2	0

CASES OF TYPHOID FEVER AT WRIGHTSVILLE—Continued.

Number.	Water Used.			Milk Supplied by	Bottles.	Cans.	Excreta Disposal.			Lime used.	Other Disinfectants.	Remarks.
	Home.	Work.	Other.				Privy.	Cesspool.	Buried.			
1	Public, ...	.....	.....	Kline & Haugh,	+	+(8/12)	..	+	..	+	Carbolic acid, ...	Pneumonia three years ago. Run down and susceptible. Glen Rock for two weeks before ill.
2	Weller W., ..	Public, ...	Big Spring,..	Kline & Haugh,	..	+	..	..	+	+	Carbolic acid, Bichloride,	Visited Columbia every Saturday and Sunday.
3	Big Spring, ..	York, ...	No, ...	Kline & Haugh, Drenning.	..	+	..	..	+	+	Formaldehyde, ...	Very light case.
4	Big Spring, Public.	Big Spring,..	Public, ...	Drenning, ...	..	+	..	..	+	+	Carbolic acid, ...	Big Spring in summer, although public in house.
5	Public, ...	Sch. Water,..	Big Spring,..	Drenning, ...	..	+	..	+	..	+	Formaldehyde.	
6	Public, ...	.....	Big Spring,..	Kline & Haugh,	..	+	+	..	..	No	No, ...	Taken to Columbia Hospital September 27. Big Spring water at Mother's. Not in bed, at Home.
7	Kerr W., ...	Big Spring,..	.....	Drenning, ...	..	+	..	..	+	+	Carbolic acid.	
8	Public, ...	School, ...	Big Spring,..	Drenning, ...	..	+	+	..	..	+	Formalin.	
9	Kerr W., ...	School, ...	Big Spring,..	Kline & Haugh,	..	+	+	..	..	+	Bichloride, Carbolic acid,	Visited in Maryland June 20 to July 21.
10	Big Spring, ..	Big Spring, ..	No, ...	Drenning, ...	..	+	+	..	..	+	Carbolic acid, Bichloride	
11	Big Spring, ..	York, ...	Public, ...	Kline & Haugh,	..	+	..	+	..	+	Carbolic acid.	
12	Crumbling W.,	.....	Big Spring,..	Drenning, ...	..	+	..	..	+	+	Carbolic acid, ...	Big Spring water before taken ill.
13	Public, ...	Big Spring,..	.....	.....	..	+	+	..	..	No	No, ...	Taken to Columbia Hospital October 4. Not in bed, at home.
14	Public, ...	Big Spring,..	No, ...	Kline & Haugh, Drenning.	..	+	+	..	..	+	Formaldehyde.	
15	Big Spring, ..	Columbia, ...	.....	Drenning, ...	..	+	..	+	..	+	Formaldehyde.	Atlantic City July 12 and 13.
16	Big Spring, ..	School, ...	.....	Kline & Haugh,	..	+	..	..	+	+	Formaldehyde.	
17	Big Spring, ..	School, ...	No, ...	Drenning, ...	..	+	..	..	+	+	Formaldehyde.	
18	Big Spring, ..	Big Spring,..	No, ...	Kline & Haugh,	..	+	..	..	+	+	Formaldehyde.	
19	Big Spring, ..	School, ...	No, ...	Kline & Haugh, Drenning.	..	+	..	..	+	+	Formaldehyde.	
20	Weller W., ..	Public, ...	Big Spring,..	Kline & Haugh, Drenning.	+	+(10/5)	..	..	+	+	Formaldehyde.	

21	Big Spring, ..	.....	No, ...	Drenning, ...	..	+	..	+	..	+	Formaldehyde, ...	Visited Col. Campbell in Reading, who died of typhoid in July.
22	Big Spring, ..	Big Spring,..	.....	Kline & Haugh,	..	+	..	..	+	+	Carbolic acid, ...	August 11, to 25 Pen Mar and Shippensburg.
23	Big Spring, ..	Big Spring,..	No, ...	Kline & Haugh,	+	.....	+	..	..	+	Carbolic acid, ...	Privy overflowing. Columbia Hospital October 19.
24	Kerr W., ...	School, ...	Big Spring,..	Drenning, ...	..	+	..	..	+	+	Formaldehyde, ...	
25	Big Spring, ..	.....	.....	Drenning, ...	..	+	..	..	+	+	Formaldehyde, ...	
26	Kerr W., ...	Big Spring,..	No, ...	Drenning, ...	..	+	..	..	+	+	Formaldehyde, ...	Big Spring piped direct to house.
27	Big Spring, ..	Big Spring,..	No, ...	Drenning, ...	+	+(10/15)	..	..	+	+	Formaldehyde, ...	
28	Big Spring, ..	S. H. W., ..	No, ...	Drenning, ...	..	+	+	..	..	No	No, ...	Columnia Hospital October 22. Died October 27.
29	Moore W., ...	S. H. W., ..	Big Spring,..	Drenning, ...	..	+	..	..	+	+	Carbolic acid, ...	Secondary case.
30	Public, ...	Big Spring,..	.....	Drenning, ...	..	+	..	..	+	+	Formaldehyde, ...	
31	Stoner Spring,	Big Spring,..	.....	Drenning, ...	..	+	+	..	..	+	Formaldehyde, ...	
							+	..	+	+	Carbolic acid.	Worked at repairing of Big Spring before taken ill and drank water therefrom.

The age of the patients is shown in the following tabulation, which also shows the age with respect to sex:

Age, Years.	Male.	Female.	Total.
0- 5,	0	1	1
6-10,	3	2	5
11-15,	1	3	4
16-20,	4	3	7
21-25,	7	1	8
26-30,	0	1	1
31-35,	2	0	2
36-40,	0	0	0
41-45,	1	1	2
46-50,	0	0	0
51-55,	1	0	1
Total,	19	12	31

The various occupations as shown in the following table indicate that at least forty-five per cent. of the patients were infants, students, housewives, or persons residing at home or a total of fourteen fall under this list. The detailed table is as follows:

Infants,	1	Laborer,	4
Students,	9	Clerk,	1
Moulder,	8	At home,	2
Machinist,	1		
Housewife,	2		
Stenographer,	3	Total,	31

With respect to the onset, the dates are set forth below. In some few cases they are only approximate.

Time of Onset.

Aug. 5, 1	Sept. 26, 1	Oct. 15, 1
Aug. 25, 1	Oct. 1, 2	Oct. 16, 1
Sept. 1, 2	Oct. 2, 2	Oct. 18, 1
Sept. 11, 1	Oct. 4, 2	Oct. 19, 1
Sept. 13, 1	Oct. 5, 2	Oct. 20, 1
Sept. 16, 1	Oct. 6, 1	Oct. 26, 1
Sept. 20, 1	Oct. 7, 1	
Sept. 21, 1	Oct. 8, 1	
Sept. 25, 2	Oct. 11, 2	

Total, 31

In the following table is given the distribution of the milk supplies.

Drenning.	Kline & Haugh.	Drenning & Kline & Haugh.
16	10	5

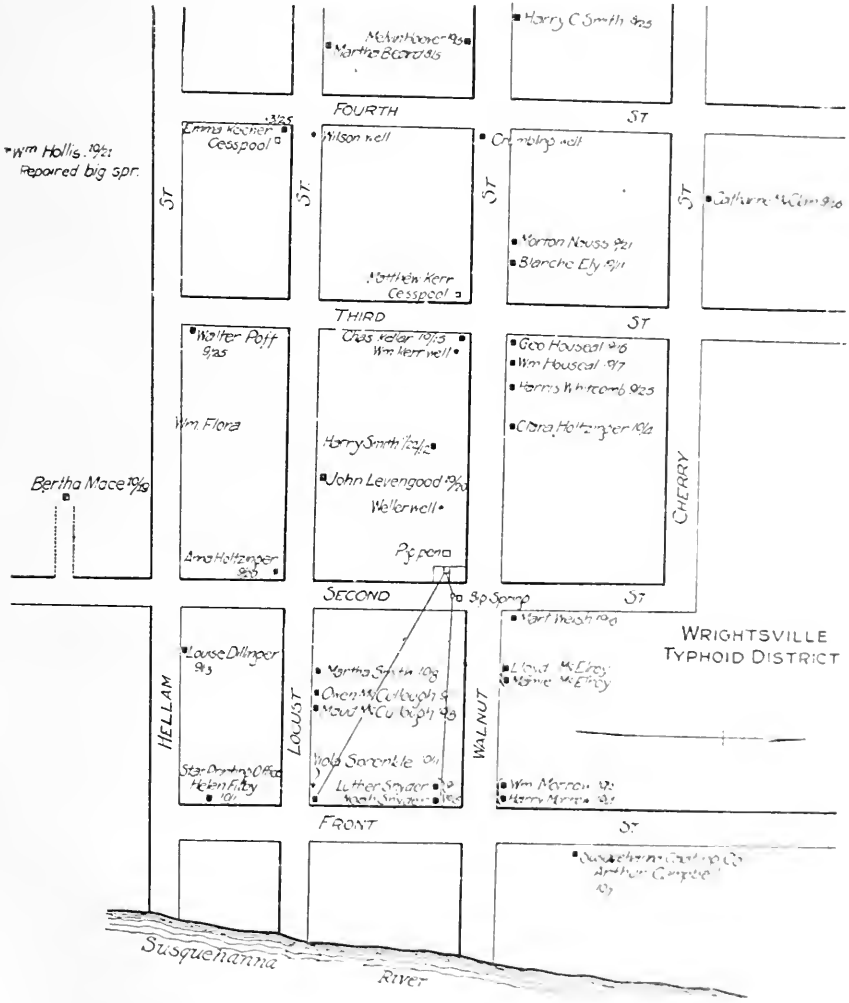
As Mr. Drenning has 300 consumers and Kline and Haugh 160 consumers, it is seen that the cases are distributed proportionately between the two dealers.

Generally speaking the cases were scattered through individual houses. Following is a tabulation of the cases with respect to their location:

	Total Houses.	No. of cases.
No. of houses with one case,	23	23
No. of houses with two cases,	4	8
	27	31

One of the significant facts with respect to the outbreak is the grouping of the cases in one section of Wrightsville. Hellam Street extends due east and west through the central part of the town. It is interesting to note that all but four of the cases reside either on Hellam Street or to the north thereof and that three of the patients who reside to the south of Hellam Street were employed in the district to the north thereof. In this section of the borough there reside approximately 900 persons. Only a small percentage of this population obtain water for domestic purposes from the mains of the Wrightsville Water Supply Company. The remainder generally use water obtained from private dug and drilled wells and from a number of springs. It is estimated that, at least during the summer months, water is entirely or at times obtained from the Big Spring by half the population residing to the north of Hellam Street.

The so-called Big Spring and the location of the typhoid fever cases in reference thereto, together with the location of the private and public dug wells and certain cesspools is shown on the accompanying sketch.



The Big Spring is located in the cellar of a double brick property located at the corner of Second and Walnut Streets, owned by Morris Kauffelt and tenanted by Samuel Welsh and Harry Townsend. It has been in use more or less for about one hundred years. Prior to 1880 the spring was not walled up and the water therefrom was delivered across the cellar in a wooden trough whence it entered a two and a half inch iron line extending across the street to a small receiving basin

This receiving basin was constructed of wood and located about twelve inches below the ground surface. An overflow pipe therefrom extended a distance of a few feet to a brick enclosure from which the inhabitants obtained their supply of water, until October 18, 1913, when it was walled up. In 1889 the spring in the cellar of the house was enclosed with brick walls and covered with stone slabs, the wooden trough was removed and a four inch cast iron bell and spigot line with cemented joints laid from the spring to the small wooden enclosure in the street, before mentioned. The original two and a half inch iron line was removed to the street line, that portion of it lying in the street proper being left in the ground. At the time of the Department's investigation on October 17th the mud cellar of the property was full of running water. It was discovered that this water came from the spring through a break in the surrounding wall. By excavating the pipe line leading to the spring enclosure in the street it was found that this cellar drainage seeped into the ground and thence flowed underneath the pavement and into the old original two and a half inch supply line passing through this line into the enclosure from which the inhabitants derived their supply. The spring issues from a limestone formation at a point about five feet below the ground surface. The cellar of the property was in a filthy condition. The running water in the cellar was used by the occupants in lieu of a refrigerator and decayed vegetable matters were scattered about. Immediately above the spring and about fifty feet distant is a pig pen and above this on the same steep slope leading toward the spring are a number of earth privy vaults filled to overflowing. On this watershed at a point three hundred feet distant therefrom at an elevation of about forty feet above the spring is the property of Harry Scott where there was a case of typhoid fever in November 1912. The wastes from the patient, it is reported, were deposited in this privy without proper disinfection. At the corner of Fourth and Locust Street is the Kocher property located above the spring and about six hundred feet distant therefrom. There was a case of typhoid fever on this property in March 1913, the wastes from the patient being discharged into a cesspool which was formerly a dug well. At the corner of Walnut and Third Street one block above the Big Spring there was a case of typhoid fever in the Mathew Kerr property in December 1911, the wastes therefrom being discharged into a cesspool.

During the month of August 1913, excessively heavy rains occurred in Wrightsville and it is reported on good authority that drainage from the hillside flowed direct through an outside cellar door into the cellar in which the spring is located. If this was the case the surface drainage undoubtedly reached the spring enclosure in the street.

On October 21st, at 11 a. m. a color test was made with uranine on the Wm. Kerr dug well located at the corner of Third and Walnut Streets and directly opposite the Mathew Kerr cesspool at a point one block west of Big Spring. One hour later positive results were obtained at the Big Spring. This shows conclusively that the waters of Big Spring cannot be made safe by enclosing the spring with concrete walls and covered and piping the supply in an iron line with tight joints to the spring enclosures in the street.

The Board of Health, however, during the week of October 20, 1913, in an endeavor adequately to protect the Big Spring, completely enclosed the spring with concrete walls and covered it with a concrete roof, laid the four inch) leading therefrom in concrete and connected the old two and a half inch line to the storm water drain. Furthermore, they laid a concrete pavement on the ground surface in the yard in the rear of the spring and constructed a concrete gutter in order to prevent, in so far as possible, any chance of surface drainage from the hillside above reaching the spring.

On October 25th, 1913, a color test was made on both the Kocher and the Kerr cesspools. The color was placed in the cesspools at 10 a. m. and a close watch was kept by a representative of the Department on the water at the Big Spring until four p. m. of the same day. No change was noticed up to this time. It is reported however, in the borough that at about five o'clock there was a noticeable discoloration of the waters in Crumbling well at the corner of Fourth and Walnut Streets, in the Wilson well at the corner of Fourth and Locust Streets and in the Wm. Kerr well at the corner of Third and Walnut Streets.

Water from the Big Spring in the cellar of the property is piped direct by means of a one inch line to three properties as follows: G. W. Moore, Geo. Kerr and D. S. Detweiler, tenanted by Mrs. Sprenkle. It appears that the spring was deeded a great many years ago to these persons by the original owner and that the borough only controls the overflow from the spring. From the small wooden box located in the street, the water is piped by one inch lines to the property of Levi Samis and George Leithiser. At the present time there is a case of typhoid fever in the Sprenkle family and two cases in the Snyder family which obtained water at all times from a hydrant in the yard of Levi Samis.

In the following list is shown the various water supplies used by the patients having typhoid fever.

Supplies.

Big Spring only,	7
Public water only,	1
Big Spring and public,	5
Big Spring and miscellaneous,	4
Big Spring, dug well and public,	5
Big Spring and dug well,	9
Total,	31

During the investigation, samples of water were collected by the representative of the Department of Health from the various sources of supply of the patients in the district. These upon analysis at the Department laboratories showed the following results:

Samples Collected September 25th.

		Bacteria per c. c.	B. Coli per c. c.
No. 1.	Wilson pump,	450	15
No. 2.	Crumbling well,	140	8
No. 3.	School house pump,	100	2
No. 4.	Waltman,	70	42
No. 5.	Big Spring,	60	2
No. 6.	Tap from public reservoir,	130	3

Samples Collected October 9th.

No. 1.	Quarry spring,	25	0
No. 2.	Fry pump,	6	0
No. 3.	Hotel pump,	35	1
No. 4.	Hoppenstall spring,	60	0
No. 5.	Hannah Kerr tank,	900	0
No. 6.	Whiltzhofer pump,	350	0

Samples Collected October 16th.

No. 1.	Reservoir Wrightsville Water Supply Company,	100	1
No. 2.	Spring to west of reservoir,	120	2
No. 3.	Spring to east of reservoir,	9	0
No. 4.	Big Spring,	40	3
No. 5.	Kerr well,	10	0
No. 6.	Broken and lost,		
No. 7.	Arthur Hilt tap from reservoir,	160	0
No. 8.	Sprenkle tap from Big Spring,	10	1
No. 9.	Crumbling spring,	80	1
No. 10.	School House well,	400	1
No. 11.	Strickler well, Hellam Street,	450	0
No. 12.	Young's dug well, Hellam Streets,	3,000	6

Samples Collected October 17th.

No. 1.	Big Spring,	28	2
No. 2.	Big Spring,	10	0

Samples Collected October 21st.

No. 1.	Cistern, Jessop farm,	400	1
No. 2.	Dug well, Poff farm,	300	0
No. 3.	Well on Hellam Street, between Fifth and Sixth,	15	0
No. 4.	School house well,	700	0
No. 5.	Waltman well, 224 Locust Street,	30	2

Samples Collected October 25th.

No. 1.	Big Spring, 10 a. m.,	10,000	5
No. 2.	Big Spring, 11 a. m.,	2,100	2
No. 3.	Big Spring, 12 m.,	1,000	0
No. 4.	Big Spring, 1 p. m.,	7,200	0
No. 5.	Big Spring, 2 p. m.,	1,500	1
No. 6.	Big Spring, 3 p. m.,	700	1

Discussion.

The local Board of Health of Wrightsville in years past has been only nominal It did not placard or take any precautions against the spread of typhoid fever On

my arrival in the borough on October 16th 1913, there were twenty-one cases of fever and none of the properties were placarded, neither had pamphlets containing rules and instructions been left at these properties. However, placards were immediately provided and posted by the local Board of Health on all properties where typhoid fever existed. Complete typhoid fever returns have not been made by the local Board of Health to the State authorities. About October 12th the following notice was placarded throughout the borough in conspicuous places and on all dug wells showing upon analysis the presence of sewage organisms:

NOTICE

All person are requested to

BOIL ALL WATER

used for domestic purposes

by order of BOARD OF HEALTH.

The supply of water furnished by the Wrightsville Water Supply Company during the past few years has been inadequate in quantity and undoubtedly contaminated at times with sewage organisms. The conditions and stipulations set forth in a permit issued to this water company on September 10th, 1909 have not been complied with and the water company obtained without a permit from the Commissioner of Health an additional source of supply during the years 1911 and 1912. Surface water entered the system during droughts and no adequate provision is made so that such surface drainage can be entirely eliminated even if so desired at any time. No typhoid fever has occurred on the watershed and although the use of public water may have been in a measure responsible for the spread of the disease, it is not probable.

No direct evidence can be adduced showing that either of the two milk supplies involved has been the source of infection. The cases were divided between the two dealers in about the same proportion as the total number of consumers.

While it is true that a case of typhoid fever occurred on a dairy farm from which milk is supplied to Kline and Haugh and also on a farm from which milk is furnished to J. B. Drenning neither of the patients had anything whatever to do with the milking at any time and from what can be learned it appears that precautions were taken to prevent the spread of the disease. During the illness of Vera Poff, the dairy was in charge of a neighbor, the house was placarded, and stools and clothes disinfected. She attended school in York returning home over Sunday. During the illness of Blair Jessop the house was placarded, disinfectants were used and the dairy was in charge of a tenant living apart from the house where the patient lived.

The significant feature with respect to the outbreak is the supply of water from the Big Spring and from individual wells. All of the cases except one used Big Spring water either wholly or in part and thirteen cases used water either wholly or in part from individual dug wells. Wrightsville is over a hundred years old and the soil of a limestone formation, extending in some instances to within a few feet of the ground surface. There are no sewers in the town and the disposal of excrement, until comparatively recently, was by means of shallow privy vaults. Within the past ten years cesspools have been constructed, the contents passing readily into the limestone cracks and crevasses. Dug wells, which until 1890, formed the only source of water supply with the exception of a few springs have been abandoned at intervals due to the contamination of water therein and converted into cesspools. These are a constant menace to the purity of the remaining dug wells and springs.

On the hillside above the Big Spring there are at least fifteen cesspools, while privy vaults are to be found on nearly every property. Dug wells are located in close proximity to thes structures and are a constant menace to the health of the inhabitants drinking therefrom. Wrightsville has indeed been fortunate in years past that it has escaped a typhoid fever epidemic for conditions in so far as the ground formation and the location of dug wells, privies, and cesspools are concerned, are most favorable for a catastrophe of this nature.

The Scott typhoid fever case occurred on the watershed above the Big Spring and about 300 feet distant in November 1912 and the patient was ill until April 1913. It is reported that during that time the wastes were disposed of into a surface privy vault that was filled to overflowing. In July of the present year this excrement was spread over a newly made garden and it is a known fact that during the heavy rains of August, surface drainage from this vicinity was washed into the cellar where the Big Spring is located. Unless the wastes were thoroughly disinfected, and this is improbable, it is likely that the contamination of the waters of Big Spring was due in part at least to this cause.

Nine of the thirty-one patients were school children, who drank water at times from the dug well located on the school property. This well is less than a hundred feet distant from and is at a slightly lower elevation than the two privy vaults maintained at the school. Prior to the opening of school the water from the well

was analyzed and did not show the presence of sewage organisms. Samples taken shortly after the outbreak of typhoid fever showed the water therein to be polluted. The well was immediately placarded. This source of supply is undoubtedly dangerous although probably not more so than the remaining dug wells within the borough limits. On October 18th, the school house was thoroughly disinfected by the local Health Officer at the suggestion of a representative of this Department and the adjacent privy vaults treated with lime. A sample from the well collected on November 12th, showed 140 bacteria to the cubic centimeter and no B. Coli.

The Big Spring was closed under a verbal order of the Department of Health on October 18th, 1913. Even prior to this date notices had been posted at conspicuous places about the borough calling attention to the necessity of boiling all water used for domestic purposes and the epidemic had assumed proportions which thoroughly alarmed the citizens. This in addition to the closing of the spring may be taken as explaining the cessation of the cases after the lapse of the incubation period. No cases have developed prior to November 18th and subsequent to October 28th, 1913, ten days after the closing of the spring. From an analysis of the facts gathered respecting the typhoid fever cases, it appears that the outbreak can be definitely attributed to the use of the polluted water from the Big Spring and numerous shallow wells. The lesson to be pointed out to the community is the discontinuance of the use of the shallow wells in lime stone formation and in the vicinity of privies and cesspools and the permanent abandonment of the Big Spring for all domestic and culinary purposes unless the water be purified.

Due to the never failing volume, clearness, coldness and extensive use of the waters of Big Spring the borough council is loath to abandon it entirely and it is at the present time taking up the question of filtering the water therefrom with a view to installing a plant for this purpose unless the cost proves excessive.

On November 18th, 1913, the Department was informed that the Big Spring had been opened to the public and the following communication was addressed to the local Board of Health:

"November 18th, 1913.

"Paul Fitzkee, Secy.,
Board of Health,
Wrightsville, Penna.

"Dear Sir:—

"It is reported by the local health officer, Dr. J. L. Jameson, that the Big Spring has been opened and the water therefrom made accessible to the public. The recent typhoid fever outbreak in your borough was attributed, in part at least, to typhoid infection of this spring and the spring was closed under my orders. In the use of this water without adequate filtration there is great danger of a repetition of the recent outbreak. Your board is requested to immediately take the necessary action to protect the public in this respect.

"Kindly let us know promptly what is being done in this matter.

"Very truly yours,
(Signed,) "SAMUEL G. DIXON."

It developed that the covering had been removed by the Burgess, his explanation being that the people in the vicinity were put to a hardship in having to carry water from slightly more distant sources. Moreover, it is reported that quite a number of the townspeople refused to heed the warning notice of the danger of using the water but instead regarded the typhoid epidemic as a thing of the past and showed an inclination to go on using the spring in the old way. The Department has advised the health authorities of the borough that this is a case where they must exercise their authority and enforce the necessary measures for the protection of public health.

The State Department of Health has done everything in its power to make the danger of this situation clear to the people of Wrightsville because it is believed to be a fundamental principle that the most rigorous enforcement of stringent laws cannot be relied upon to control the everyday personal habits of people until they have come to understand and thoroughly to appreciate the basic reasons for the regulations with which they are asked to comply.

That co-operation on the part of a few of the townspeople has been lacking is deeply regretted by the Department, but far more serious than this is the apparent utter failure of these persons to appreciate the imminent danger that typhoid germs may at any time again and without warning, be present in the Big Spring and surely cause the disease in some of those who use the raw water.

On November 20th, the Wrightsville Water Supply Company, in compliance with the orders of the Commissioner of Health, installed on the gravity line leading from Spring No. 1 to the reservoir, a temporary hypochlorite of lime treatment plant to be used until the proposed filter plant is constructed. The apparatus consists of a mixing barrel and standard orifice box equipped with float and regulating valves. The barrel is filled each twelve hours, one pound of lime being used every twenty-four hours under normal conditions.

VI. REFERENCES TO SPECIAL COUNSEL.

COMMONWEALTH VERSUS BOROUGH OF MARS.

This suit was instituted because of illegal sewerage installed by the borough of Mars, contrary to decrees of this Department, issued by the unanimous agreement of the Governor, Attorney General, and Commissioner of Health. The opinion and decree of the Court are very favorable to the State Department of Health and the case was the most important of any in which this Department was interested during the year, and, in connection with the several important Court decisions of earlier years, firmly establishes the interpretation which this Department has put on the Act of April 22, 1905, and the campaign which it has conducted thereunder for the protection of the State waters from pollution.

This opinion disposes conclusively of the contention made by the Borough of Mars, and so often made by other municipalities, as a plea to be relieved of installing sewage treatment works, that the borough is financially unable to undertake the work because of the limit of indebtedness imposed on municipalities by the State Constitution. The opinion concludes that this constitutional limitation of indebtedness does not exempt a municipality from liability for wrongful acts, even though this liability may lead to an increase of indebtednes beyond the constitutional limit, but that it does prohibit voluntary creation of a debt in excess of that limit, and further, that "it may be that the municipality would not be exempt from liability growing out of the mandatory requirements of the State's exercise of its police power in order to preserve the public health and welfare."

The suit of the Commonwealth was instituted by the Department of the Attorney General. Hon. J. E. B. Cunningham, Deputy Attorney General, with T. C. Campbell, Esq., of Butler, as local counsel, conducted the case before President Judge, James M. Galbreath, in the Court of Common Pleas of Butler County sitting in equity. Wednesday, September 24th, 1913, was set for the trial, which was conducted in Butler and continued through the week. For the Department Dr. J. M. Campbell explained his bacteriological analyses conducted at the Department's laboratories of samples collected from the stream flow and sewage at Mars and the significance of the results. Assistant Engineer, C. H. Cummings, explained the transportation of sewage and pathogenic organisms down stream, the great distances to which they might be carried to the menace of public health, and the

engineering investigations which have been made in the study of these problems. Inspectors, R. M. Souder, D. J. Marshall, W. W. Reno, D. M. Irwin and Wm. Davis explained their tests of the sewer connections and their collecting of samples for analysis.

The discussion and conclusions of Judge Galbreath in his opinion are quoted as follows:

"DISCUSSION."

"By virtue of a decree of the Common Pleas Court of Butler County, bearing date March 23, 1895, the village of Mars in said County became an incorporated borough under the name, style and title of the Borough of Mars. Being without a system of sanitary sewers the municipal authorities of said borough, on July 24, 1908, made application to the State Department of Health of Pennsylvania, under Act of April 22, 1905, P. L. 260, entitled 'An Act to Preserve the Purity of the Waters of the State, for the Protection of the Public Health,' for leave to construct a system of sanitary sewers in the borough and to discharge the sewage into Breakneck Creek, which flows through said Borough and setting forth that a bond issue of $10,000.00 had been voted for that purpose. On April 15, 1909, a decree was issued by authority of the Governor, Attorney General and Commissioner of Health of the Commonwealth approving the proposed system 'as soon as the borough shall have prepared the plans for a sewage disposal plant and a connecting sewer and that this approval shall not be given until the plans for the sewage disposal works and the sewers are satisfactory in every particular to the State Department of Health, and until the borough can and shall, either directly or indirectly, bring about the construction of a sewage disposal works and the treatment of the sewage of the town' and that 'discharge of raw sewage into Breakneck Creek or its tributaries cannot be approved.'

"On March 25, 1910, the borough authorities submitted to the Department of Health plans for the construction of a sewage disposal works in connection with the proposed sewer system, which were approved May 31, 1910, on condition, *inter alia*, that 'no sewage whatsoever shall be discharged from said sewer system into the waters of the State. The sewage shall be delivered to a sewage purification plant and therein be subjected to treatment and be purified and rendered satisfactory to the State Department of Health,' and that 'the discharge of raw sewage into Breakneck Creek or its tributaries, cannot be approved' which decree was accepted by the authorities of the borough and recorded in the office of the Recorder of Deeds in and for Butler County on July 20, 1910.

"On September 29, 1910, the Borough authorities submitted to the State Department of Health plans for a sewage disposal works in conformity with the terms of the permit of May 31, 1910, which plans were approved November 18, 1910, subject, *inter alia*, to the condition that the permit of May 31, 1910, be and remain in full force and that 'the discharge of sewage from the sewer system into the waters of the State from the sewer system or sewage disposal works from the borough is prohibited.'

"This permit was also accepted by the borough authorities and recorded in the Recorder's office aforesaid April 16, 1912.

"No appeal was taken from any of said decrees to the Common Pleas Court of Butler County under the provisions of said act of April 22, 1905, Section II.

"The said Act provides in the Fourth Section thereof that 'No person, corporation or municipality shall place or permit to be placed, discharge or permit to flow into any of the waters of the State, any sewage except as hereinafter provided.' That is, pursuant to a permit and on the conditions imposed by the Governor, Attorney General and Commissioner of Health of the State. This Act was passed, as its title indicates, 'to preserve the purity of the waters of the State, for the protection of the public health.' The term 'waters of the State' under the provisions of the Act includes 'all streams and springs and all bodies of surface and of ground water, whether natural or artificial within the boundaries of the State.' As was said by the Supreme Court in Commonwealth vs. Kennedy, 240 Pa. 240:

> 'This does not make all such streams public streams, but it does subject them to public control, because while not public streams, they are susceptible of being turned into public nuisances.'

"In the case in hand the supervisory power of the State was exercised through the permits granted and conditions imposed on the defendant municipality in the several orders and decrees issued by the proper officers of the State. These having been duly recorded and unappealed from became operative from the date of record.

"It is to be observed that in none of the decrees so issued, is permission given to the defendant borough to discharge raw sewage into Breakneck Creek. On the contrary such permission is expressly withheld. That the defendant mu-

nicipality has been discharging sewage through its sewer system and the drain connected therewith, into Breakneck Creek, a part of the waters of the State, is beyond controversy. In doing so, however, it contends that it is not thereby creating a public nuisance and that in any event the present state of its indebtedness is such that it cannot be increased in sufficient amount to construct a sewage disposal plant without exceeding the constitutional limit.

"The first of these contentions cannot be sustained. Whether the facts in evidence are sufficient to establish the existence of a common law nuisance is not the question to be determined. The unauthorized discharge of sewage into the waters of the State has been prohibited by the State in the exercise of its police power, from which it results that any violation of the statutory prohibition is a public nuisance. In the case of the Commonwealth vs. Kennedy, *supra*, the Supreme Court says that 'Because the public health is endangered by drainage of sewage into any flowing stream, the Legislature has denounced it as an offense on the part of anyone permitting it. In no more positive way could it be declared a public nuisance.'

"And even aside from the statute we think the facts in evidence are sufficient to establish a public nuisance at common law. The tests made of the sewage being discharged into the creek and of the waters of the streams at various points below the point of discharge, reveal the presence of bacteria in very large numbers, ranging as high as 3,200,000 of all kinds, with 900,000 of the colon bacilli per cubic centimeter. In the light of present day knowledge, it requires no flight of imagination to believe that the sending forth of such a stream laden with all its dangerous possibilities through inhabited communities and in turn to become a tributary to large streams, flowing by and through still other communities, in the very nature of the case, creates a public nuisance. The argument that the natural flow of the water will, within a few miles purge itself of its deleterious character does not rest upon that accurate test which would, under all circumstances, make it a safe working hypothesis. The volume of water carried by the stream, the rapidity of its flow and many other circumstances, it may well be believed, would tend to modify or defeat the theory so advanced.

"It clearly appearing that the defendant borough in discharging the sewage from its sewere system into Breakneck Creek is doing that which has been prohibited by law and is a public nuisance, it follows that a Court of Equity may put forth its hand to prevent threatened injury. Hill *vs.* Commissioners, 1 Parsons Select Equity Cases 501: Commonwealth *vs.* Rush, 14 Pa. 186.

"This conclusion renders it unnecessary to consider or decide the question whether a municipality can justify the continued maintenance of a public nuisance of the kind herein complained about on the ground of its inability to abate it by the construction of a sewage disposal plant without transgressing the constitutional limit of indebtedness. The limit of indebtedness imposed by the Constitution on municipalities does not exempt them from liability for wrongful and tortuous acts, which may result in an increase of municipal indebtedness beyond the limit so fixed, but it does prohibit and prevent voluntary assumption or creation of any debt in excess of that limit. It would seem that the voluntary character of the municipal act, whereby the debt is increased beyond the constitutional limit is the thing which offends against the constitutional prohibition. Keller *vs.* Scranton, 200 Pa. 130. In view of the provision of Section 3 of Article XVI of the Constitution that "The exercise of the police power of the State shall never be abridged,' it may be that the municipality would not be exempt from liability growing out of the mandatory requirements of the State's exercise of its police power in order to preserve the public health and welfare. But the disposition of the case before the Court does not require the determination of that question. It is clear that the borough of Mars is maintaining a public nuisance. The right of the public to be protected against the results of its continuance is equally clear. From these two facts results the Court's duty to restrain the wrongful act and thus prevent its threatened consequences. And even if it were true that said borough cannot lawfully expend the money necessary to remove the offending cause by the construction of a sewage disposal plant, the result will be that it will fall back into the more primitive methods of caring for its sewage, which prevailed before any sewer system was constructed, unless it shall be able to make some temporary arrangement satisfactory to the health authorities of the State for the purification of its sewage, until such time as its financial condition will enable it to construct a satisfactory disposal plant. To go back to former conditions would doubtless entail much inconvenience upon the residents of the borough whose toilet rooms are connected with the public sewer. But individual annoyance and inconvenience when balanced against the health and welfare of the larger community, represented by the Commonwealth, must give way in order to the greater good. In order, however, that unnecessary hardship may be avoided, a reasonable period of time should be given in order to the adjustments which will necessarily follow the restraining order of the court

"The contention on the part of the defendant's counsel that the Court in this proceeding may modify the decree of the Department of Health or set it aside as though the matter were now being heard on appeal as provided by the Act of Assembly cannot, we think, be sustained. We are not convinced that the Court

should now and in this proceeding, instituted by the Commonwealth, modify or set aside the decrees or any of them issued by the proper authorities of the State as though appeals therefrom had been taken by the borough defendant. Nor, indeed, if the authority to do so were clear would it seem that any ground exists for such action in view of the reasonable character of the requirements and conditions imposed.

"CONCLUSIONS OF LAW."

"First. Any municipality placing or permitting to be placed, or discharging or permitting to flow into any of the waters of this State any substance containing any of the waste product or excrementitious or other discharges from the bodies of human beings without a permit authorizing it to do so, duly granted by the Commissioner of Health pursuant to the unanimous opinion of the Governor, the Attorney General and the Commissioner of Health, is maintaining a nuisance *per se* by reason of the provisions of the Act of April 22nd, 1905, P. L. 260, and is committing an act contrary to law and prejudicial to the interests of the community, the continuance of which may be enjoined by a Court of Equity.

"Second. Under the facts proven in this case, the Borough of Mars, by placing or permitting to be placed and by discharging or permitting to flow into Breakneck Creek substances containing the waste products and excrementitious or other discharges from the bodies of human beings is making said Breakneck Creek a public nuisance and should be restrained from continuing said nuisance.

"Third. The defendant, Borough of Mars, having obtained permission to build the sanitary sewer system in question through the representation upon its part that a sewage disposal plant would be built for the purification of the sewage, should be enjoined from permitting any sewage, as defined by said Act of April 22, 1905, P. L. 260, to be collected in, or discharged through, said sewer system until said disposal plant has been built and approved by the State Department of Health or until such time as such other arrangement for the purification of said sewage shall be made as will be satisfactory to the State Department of Health, until said sewage plant can be constructed. In order, however, that no unnecessary hardship may be imposed upon individuals now discharging sewage through the sewers of the borough into the waters of the State, such restraining order should not become operative until a reasonable period has intervened, during which the necessary readjustments may be made.

"Fourth. The costs hereof should be paid by the defendant.

"Let a decree therefor be entered nisi by the prothonotary in accordance with the foregoing conclusions, and unless exceptions be filed sec. reg. to the findings of fact or conclusions of law hereinbefore set forth, let a final decree be prepared accordingly.

"By the Court,

"JAMES M. GALBREATH,
"President Judge."

The final decree in this case is quoted as follows:

"COMMONWEALTH OF PENNSYLVANIA *EX REL.* JOHN C. BELL, ATTORNEY GENERAL,

VS.

"BOROUGH OF MARS AND J. A. CRISWELL, BURGESS, AND C. W. CRAWFORD, O. W. FISKE, JOHN DUNLAP, WARREN ARCHER, J. J. SHERIDAN, A. C. ZEIGLER, AND C. L. NORTON.

"IN THE COURT OF COMMON PLEAS OF BUTLER COUNTY.

SITTING IN EQUITY. NO. 4, MARCH TERM, 1913.

"FINAL DECREE."

"And now, December 31, 1913, this cause came on to be heard at this term, and was argued by counsel, and upon consideration thereof it is ordered, adjudged and decreed as follows, viz.,

"That an injunction issue, enjoining and restraining the Borough of Mars, its present burgess and members of council, their successors in office, and its and their servants, employees and agents, from permitting any sewage, *i. e.*, any substance that contains any of the waste products, or excrementitious or other discharges from the bodies of human beings or animals, to be collected in or discharged through the sewer system now constructed in said Borough of Mars into Breakneck Creek, or any of the waters of the State, until said Borough of Mars shall have built a sewage disposal plant which shall have received the approval of the Governor, the Attorney General and the Commissioner of Health

of the Commonwealth of Pennsylvania, after which sewage may be collected in said sewer system, and the purified effluent discharged into said Breakneck Creek. 'The injunction hereby awarded, however, shall not become operative for a period of eighteen months from the date hereof, to-wit, until the first day of June, A. D. 1915, provided that on or before the first day of June, 1914, the public authorities of said borough of Mars having charge of said sewer system, shall have installed a chemical disinfecting plant for the disinfection of the sewage collected in and discharged through said sewage system, which said disinfecting plant shall be installed and operated to the satisfaction of the Commissioner of Health of the Commonwealth of Pennsylvania, and provided further that no extensions shall be made to said sewer system, nor shall any additional connections therewith be permitted until the completion of the above mentioned permanent sewage disposal plant.'

"The defendants are directed to pay the costs.

"By the Court."

OTHER CASES REFERRED TO SPECIAL COUNSEL.

During the year 1913, forty-two cases were referred to Department Attorneys in nine Counties of the State, by officers of the Department, at the direction of the Commissioner, where they were enable to secure abatements after repeated interviews with the owners or occupants of the properties.

In addition to writing a letter in each case, calling the attention of the owner or occupant to the complaint of the Department and to the law governing the case, and suggesting the advisability of complying with the request of the Department, that he might save himself the trouble and expense of a Magistrate's hearing, Counsel for the Department in most instances made a personal inspection and had an interview. When the owner persisted in his refusal to abate, after a letter and interview, prosecutions were promptly begun in all cases where the evidence of pollution was sufficient to justify such procedure.

The object of all Departmental proceedings has been to secure permanent abatements. For this reason, the owner or occupant is given the opportunity of disposing of his case at any stage of the proceedings by making a permanent abatement and paying the costs.

Twenty-one of the cases were closed during the year, twenty-one cases remaining open on January 1st, 1914.

Forty-one cases which had been referred before January 1st, 1913, were closed during the year.

A table of cases by counties follows:

County.	Attorney.	Cases referred previous to 1913. Closed 1913.	Cases referred 1913.	Cases referred 1913. Closed 1913.	Cases referred 1913. Pending January 1, 1914.
Adams,	Robert E. Wible,	0	2	2	0
Berks,	Williams & Sinkler,	10	8	5	3
Bradford,	Benjamin Kuykendall, Jr.,	1	2	1	1
Cambria,	D. P. Weimer,	1	2	2	0
Carbon,	Frederick Bertolette,	9	0	9	0
Chester,	Williams & Sinkler,	6	10	8	2
Lancaster,	Coyle & Keller,	1	0	0	0
Lycoming,	Allen & Reading,	1	0	0	0
Mifflin,	Rufus Elder,	0	1	1	0
Montgomery,	Williams & Sinkler,	0	4	1	3
Northumberland,	Charles M. Clement,	0	12	0	12
Schuylkill,	John F. Whalen,	10	0	0	0
Union,	F. E. Bower,	1	0	0	0
Venango,	John L. Nesbit,	0	1	1	0
York,	George H. Kain,	1	0	0	0
Total,		41	42	21	21

Special attention is called to these cases: William R. Moser, Borough of North Wales, The Coatesville Hospital, Chester County Poor House, and Charles R. Kennedy.

CASES REFERRED IN 1913.

ADAMS COUNTY.

Mrs. H. M. Keller, Franklin Township. Pollution of Marsh Creek above the Gettysburg intake. Referred June 12th. Reported closed June 17, without litigation.

George W. Sharrah, Franklin Township. Pollution of Marsh Creek above the Gettysburg intake. Referred June 12th. Reported closed June 17th without litigation.

BERKS COUNTY.

Mrs. Cyraine Snyder, Upper Tulpehocken Township. Pollution of North Kill Creek. Referred January 31st. Hearing before Alderman Weber at Reading February 13th. Defendant bound over to June Term of Court of Quarter Sessions. Reported closed May 23rd, upon payment by the defendant of accrued costs to date, abatement having been made.

Reading City Reduction Company, Cumru Township. Pollution of Angelica Creek above intake of the Angelica Water Company. Referred March 12th. Reported closed November 4th, without litigation.

Roth Brothers, Cumru Township. Pollution of Angelica Creek above the intake of the Angelica Water Company. Referred March 14th. Reported closed July 24th, without litigation.

George Rhode, Kutztown Borough. Pollution of Saucon Creek, used as an emergency supply to Kutztown Borough. Referred June 9th. Reported closed December 19th, without litigation.

Frank Wagner, Center Township. Pollution of Schuylkill River. Referred July 8th. Reported closed November 1st, without litigation.

Aaron Knoll, Tulpehocken Township. Pollution of Swatara Creek. Referred October 1st. Hearing before Alderman Weber at Reading October 9th. Defendant bound over to December Term of Court of Quarter Sessions. Case continued to next term of court, pending at close of year.

The Allentown Portland Cement Company, Maiden Creek Township. Pollution of Maiden Creek above Reading intake. Referred October 21st. Pending at the close of the year.

John Baer, Cumru Township. Pollution of Wyomissing Creek. Referred October 21st. Pending at the end of the year.

BRADFORD COUNTY.

Ernest Bohlayer, Troy Township. Pollution of stream used as a supply to Troy Borough. Referred December 5th. Hearing before Justice Meredith December 18th. Defendant pleaded guilty, paid the costs, and gave bond to abate. Abatement not reported at close of the year.

C. H. Williams, Troy Township. Pollution of Sugar Creek. Referred October 11th. Hearing before Justice Meredith at Towanda November 1st. Defendant pleaded guilty, paid costs, and case was reported closed during December by an abatement.

CAMBRIA COUNTY.

G. H. Fyock, Richland Township. Pollution of Little Paint Creek, an emergency supply to Windber Borough. Referred February 20th. Reported closed March 4th, without litigation.

N. J. Hoffman, Richland Township. Pollution of Little Paint Creek, an emergency supply to Windber Borough. Referred February 20th. Reported closed February 27th, without litigation.

CHESTER COUNTY.

William R. Moser, North Coventry Township. Pollution of a small tributary of the Schuylkill River by depositing the cleanings of cesspools from the Borough of Pottstown on a hillside close to the stream. Referred January 27th. Hearing before Justice Paxson at West Chester February 8th. Defendant was bound over to next term of Quarter Sessions Court, and a true bill found. While the testimony of the Inspectors showed that they had visited the premises on a wet day in January, and had seen the excrement actually washed to the stream, the jury brought in a verdict of not guilty, but imposed one-half of the costs, amounting to over one hundred dollars, on the defendant. On May 5th, the Court ordered that the costs of the plaintiff be eliminated from the verdict.

The Coatsville Hospital, Valley Township. Pollution of Sucker Run. Referred March 18th. Reported closed July 16th, by the construction of adequate cesspools and the disconnection of the kitchen wastes and wash water pipe, which had hitherto run to the stream.

John H. Jackson, West Goshen Township. Pollution of Chester Creek. Referred March 27th. Hearing before Squire Paxson at West Chester April 7th. Reported closed April 14th, upon payment of costs, as an abatement had already been made.

Robert Johnson, West Goshen Township. Pollution of Chester Creek. Referred March 27th. Reported closed May 1st without litigation.

Catherine Hall, West Bradford Township. Pollution of a stream used as a supply by the Borough of Downingtown. Referred May 20th. Pending at the close of the year.

Herbert C. Smith, West Goshen Township. Pollution of Chester Creek above the intake for West Chester. Referred May 20th. Reported closed July 11th without litigation.

John J. Armstrong, West Bradford Township. Pollution of a stream used as an emergency supply to Downingtown Borough. Referred May 20th. Pending at the close of the year.

Leon Holman, East Pikeland Township. Pollution of Pickering Creek above the intake of the North Springfield Water Company. Referred May 20th. Reported closed July 14th without litigation.

Henry C. Baldwin, West Goshen Township. Pollution of Chester Creek above the West Chester intake. Referred May 20th. Reported closed July 11th without litigation.

Louis M. Hickman, East Bradford Township. Nuisance. Referred August 1st. Hearing before Justice H. B. Hamilton at West Chester August 4th. On September 1st defendant pleaded guilty before the Court. Sentence was suspended pending payment of costs, and the continuance of the abatement of the nuisance. Reported closed October 10th.

MIFFLIN COUNTY.

Charles Savercool, Granville Township. Nuisance. Referred December 3rd. Reported closed December 18th, without litigation.

MONTGOMERY COUNTY.

Franklin Watson, Moreland Township. Pollution of Pennypack Creek above the intake of the Moreland Spring Water Company. Referred November 20th. Pending at the close of the year.

In the case of the Borough of North Wales, the Department, subsequent to the refusal on the part of the electors to favor an issue of bonds for the construction of a sewage disposal plant, served a number of citizens with orders to

abate nuisances existing on their premises, consisting in most cases of a discharge of kitchen wastes and wash water. After a careful investigation of the evidence and the general conditions existing in the Borough, it was deemed advisable, in view of the fact that the pollution of the stream was largely due to the discharge from certain sewers constructed by the Borough, that the prosecution should be brought against the Borough itself on the charge of maintaining a common nuisance in the first instance, rather than against any of the individual citizens so served. An information was therefore prepared and returned by a constable, whereon a bill of indictment was submitted to the Grand Jury by the Court of Quarter Sessions of Montgomery County, and a true bill found March 6th. Counsel for the defendant Borough then began negotiations which terminated in an agreement being entered into stipulating that the Borough should again submit the matter to the voters, and that, in case the loan for the construction of a disposal plant was authorized, then the case pending against the Borough should be disposed of on the payment of costs by the defendant. At the close of the year, therefore, this case was still pending, and the borough had carried out its part of the agreement to the extent of passing the proper ordinance preparatory to the special election to be held in January, 1914.

Charles H. Speath, Whitpain Township. Pollution of Stony Creek. Referred March 17th. Reported closed September 23rd, upon payment of costs, an abatement having been made.

Nora McAvoy, Moreland Township. Pollution of Pennypack Creek above the intake of the Moreland Spring Water Company. Referred February 6th. Information before Squire Lenhart at Norristown. Hearings continued. Case pending at close of year.

NORTHUMBERLAND COUNTY.

The following cases for the pollution of Quaker Run in Mount Carmel Township, were referred December 4th and were pending at the close of the year:

George Watkins, Joseph Long, James Thomas, James Thomas (Agent), Joe Yalmast, George Cowinski, Charles Gutish, Frank Duran, Mrs. Alfred Fry, Calman Lipot, Steve Edward, Frank Panta.

VENANGO COUNTY.

H. L. Dale, Cornplanter Township. Nuisance. Referred May 13th. Reported closed May 31st, without litigation.

CASES REFERRED PREVIOUS TO 1913, CLOSED DURING 1913.

BERKS COUNTY.

Edwin Eshbach, Colebrookdale Township. Pollution of Schuylkill River. Reported abated June 11th, costs having been previously paid.

A. A. Gery, Ontelaunee Township. Pollution of Maiden Creek above Reading intake. Reported closed November 1st, without litigation.

Sylvanus Adams, Perry Township. Pollution of Maiden Creek above Reading intake. Hearing before Alderman Weber at Reading in December, 1912. Reported closed May 23rd, upon payment of costs, as an abatement had already been made.

William Romig, Douglass Township. Pollution of Schuylkill River. Reported closed April 23rd, without litigation.

W. F. Livingood, Oley Township. Pollution of Manatawny Creek. Reported closed November 1st, without litigation.

Peter Peiffer, Lower Heidelberg Township. Pollution of Schuylkill River. As costs were not paid, although an abatement was reported in 1912, this case was called for trial before the March Term of the Court of Quarter Sessions of Berks County, and a jury verdict of not guilty was returned.

Henry Crist, Penn Township. Pollution of Schuylkill River. Hearing before Alderman Weber at Reading on February 13th. Reported closed May 23, upon payment of accrued costs to date, an abatement having been made.

George Weber, Tulpehocken Township. Pollution of Schuylkill River. Case dropped June 10th, owing to the death of the defendant.

Charles Anspach, Jefferson Township. Pollution of Plum Creek. Hearing before Alderman Weber at Reading February 13th. Defendant bound over to June Term of Court of Quarter Sessions. Reported closed May 23rd, upon payment of costs, as an abatement had been effected

Lee Rosenberger, Colebrookdale Township. Pollution of Ironstone Creek. Nolle Prosequi entered March 20th.

BRADFORD COUNTY.

Robert Boyd, Canton Township. Pollution of Mill Creek, used as a supply to Canton Borough. Reported closed September 19th without litigation.

CAMBRIA COUNTY.

F. C. Sharbaugh, Carroll Township. Pollution of Chest Creek, used as a supply to Patton Borough. Reported closed August 16th, without litigation.

CARBON COUNTY.

Henry Swartz, Mahoning Township. Pollution of Lehigh River. Reported closed March 7th, without litigation.

Victor Rehrig, Mahoning Township. Pollution of Lehigh River. Reported closed February 28th, without litigation.

Norman Long, Mahoning Township. Pollution of Lehigh River. Reported closed March 7th, without litigation.

Irvin B. Merkel, Mahoning Township. Pollution of Lehigh River. Reported closed March 7th, without litigation.

John Swartz, Mahoning Township. Pollution of Lehigh River. Reported closed February 28th, without litigation.

John Kugler, Mahoning Township. Pollution of Lehigh River. Reported closed February 28th, without litigation.

Fred Mangold, Mahoning Township. Pollution of Lehigh River. Reported closed March 7th, without litigation.

R. N. Anthony, Franklin Township. Pollution of Lehigh River. Reported closed February 26th, without litigation.

Thomas Beltz, Mahoning Township. Pollution of Lehigh River. Reported closed March 4th, without litigation.

CHESTER COUNTY.

In the case of the Commonwealth versus Charles R. Kennedy, et al., William I. Schaffer, Esq., was associated with Williams and Sinkler in an action in equity by a bill filed by the Attorney General praying for an injunction to restrain the defendants, the owners and operators of a sewage disposal plant, from maintaining a nuisance arising from the discharge of sewage from the said plant into two small streams forming the head waters of Darby Creek. This sewage plant, located in Easttown Township, Chester County, was intended to dispose of the sewage from thirty or more private residences and a summer hotel known as the Devon Inn. The plant, taken as a whole, was of a style known as an irrigation plant, and was therefore operated without filter beds or appliances for chemical or other sterilization. It depended solely on the evaporation and the absorptive capacity of the soil increased by irrigation trenches. The evidence of the Commonwealth showed that on occasions of heavy rainfall the whole area was inundated and raw sewage overflowed and was directly discharged into the streams, which discharge was prejudicial to the health of those citizens of the Commonwealth who might use the water from said streams for domestic purposes, and indirectly, to a much larger number of citizens supplied with milk from dairy farms located along said streams. The learned Court below, after hearing the testimony of the Commonwealth and of William T. Hunter, of the Devon Drainage Association, the only defendant who resisted this proceeding, held that in its opinion the lower portion of the plant was ill adapted for sewage disposal and its use resulted in the escape of sewage into the streams. In view of the fact, however, that the waters of Darby Creek had not been taken under the exercise of eminent domain so as to give the public the right to receive pure or any other kind of water therefrom, the Court held that the State had no standing to proceed in equity on the ground that the pollution complained of was a public nuisance. The bill was accordingly dismissed at the cost of the Commonwealth.

On appeal to the Supreme Court, however, Mr. Justice Stewart, in his opinion held that the Act of April 22nd, 1905, enlarged the class of common nuisances so that it included the discharge of sewage into any of the waters of the State whether for other purposes they may be public or private, and that the Court in equity had jurisdiction to restrain the defendants in this case from operating their plant in such a way as to cause such a nuisance. The decree of the lower Court, therefore was reversed, and a final decree entered restraining the defendants from maintaining and operating their sewage plant in its present location in such a manner as to permit sewage to escape from said plant and drain and flow into Darby Creek and its tributaries, the costs to be paid by the defendants.

Michael Daley, Kennett Township. Pollution of Red Clay Creek. Reported closed March 29th, without litigation.

B. F. Pierce, Kennett Township. Pollution of Red Clay Creek. Indictment ignored by Grand Jury April 29th.

J. R. Holman, East Pikeland Township. Pollution of Pickering Creek above the intake of the North Springfield Water Company. Reported closed December 29th, without litigation.

Charles Maitland, East Fallowfield Township. Pollution of a tributary of West Brandywine Creek. Reported closed March 7th, without litigation.

Chester County Home, West Bradford Township. Pollution of West Brandywine Creek. Reported closed November 20th, without litigation, by the construction of a modern sewage treatment plant in accordance with plans submitted to and approved by the State Department of Health.

LANCASTER COUNTY.

C. C. Kirk, Quarryville Borough. Pollution of Little Beaver Creek. A jury verdict of guilty was returned in this case in November, 1912. An abatement and the payment of costs were reported in October, 1913.

LYCOMING COUNTY.

John Robinson, Cogan House Township. Pollution of Larrys Creek, used as a supply to Jersey Shore Borough. A hearing was held before Justice James Martin at Jersey Shore in 1912. An abatement and payment of costs were reported September 20th, 1913.

SCHUYLKILL COUNTY.

Charles Dillman, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

Fred Hoffman, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

Fred Wagner, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

Harry Speidle, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

Walter Nice, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

Sarah Nice, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

John Nisely, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

Joseph Kaler, Frackville Borough. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

William Robbins, West Mahanoy Township. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

George Parkins, West Mahanoy Township. Pollution of Little Mahanoy Creek, used as a supply to Ashland Borough. Reported closed February 26th, without litigation.

UNION COUNTY.

S. E. Benner, New Berlin Borough. Pollution of Penns Creek above Selinsgrove intake. Reported closed February 5th.

YORK COUNTY.

C. D. Strasbaugh, Springfield Township. Pollution of Codorus Creek above the intake of the York Water Company. Reported closed May 20th, without litigation.

VII. CONCLUSIONS

There are two propositions which encompass the entire scope of the administration of the law for the preservation of the public health in so far as the discharge of sewer systems is concerned, and they are;

FIRST: The degree of safety which can be expected to be obtained in treating sewage for the removal of bacterial infection.

SECOND: The relative importance of sewage disposal plants and other health protective work, including treatment plants for water works, regarded in the light of the limited resources of the municipal corporation as defined by the constitutional limits of indebtedness and of private corporations, as determined by water rates fixed by franchise or contract with the municipality.

In settling these questions in any particular case, a thorough consideration of all the factors must be had. Each case is a special problem in itself. In Pennsylvania, owing to the variety of watersheds, geological formation and the development of natural resources, each of which, to a greater or less degree determines the quality and quantity of the waters flowing from the watershed, it is practically impossible to adopt and promulgate any general standard for a guidance of local authorities and for experts employed by local authorities, with respect to water works systems and sewer systems and the quality of the waters which are the sources of supply to the public. Some of the streams in Pennsylvania are given over absolutely as carriers of industrial wastes, particularly in the coal fields where drainage from mines destroys all life in the waters. The highest court of the Commonwealth and the Legislature have each determined the rights of corporations in these districts. In preserving the purity of the waters of the State, each municipality or private corporation in what it does or wishes to do, has its own peculiar relationship to the problem.

The policy of setting forth at length many of the reasons which govern determinations of the Commissioner of Health, or of the Governor, Attorney General and Commissioner of Health in the case of sewage disposal, which up to 1911 prevailed in the decrees has been discontinued. In substitution therefor many conferences have been held during the year with local authorities and a better understanding of the entire subject has resulted. Engineers and others can obtain information by reference to reports on file in the office of the Department.

DIVISION OF ACCOUNTING AND PURCHASING.

E. I. SIMPSON, *Chief of Division.*

THE DIVISION OF ACCOUNTS.

Eighth Annual Financial Report.

The Commissioner begs leave respectively to report that under the appropriations of the Legislature for the use of the several divisions of the Department, the following sums were received and expenditures made during the year 1913.

APPROPRIATIONS.

ACT NO. 219, SESSION—1905.

Summary showing balance to December 31, 1907, as given in Second Annual Report of the Department.		
Emergency Fund, to be used as occasion may require in the suppression of epidemics, the prevention of disease, or in times of disaster threatening disease, the sum of,.....		$50,000 00
Total expenditures as in report of December 31, 1906, ...	$20,191 09	
Total expenditures as in report of May 31, 1907, ...	5,549 98	
		25,741 07
Unexpended balance appropriation January 1, 1913,.....		$24,258 93

Note:—There were no expenditures on account of this fund from June 1, 1907, to January 1, 1913:

ACT NO. 355, SESSION—1907.

Summary showing balances to December 31, 1912, as given in the Seventh Annual Report of the Department.

State Institution for Feeble-Minded of Western Pennsylvania, Polk, Pa., this work was to be done under the direction of the Commissioner of Health and for this purpose the amount set aside was, ...		$5,000 00
Total expenditures as in report of December 31, 1909,.....	$3,563 54	
Total expenditures as in report of December 31, 1910,.....	1,153 33	
Total expenditures as in report of December 31, 1911,.....	139 96	
		4,856 83
Unexpended balance on hand, January 1, 1913, ...		$143 17

ACT NO. 864, SESSION—1911.

Item No. 1, for the payment of salaries of the General Office, Medical Division, Laboratories and Experimental Stations, Division Distribution of Biological Products, Bureau of Vital Statistics, Morbidity and Marriage Statistics, Sanitary Engineering Division, Division of Accounting and Purchasing, Division of Supplies, and Division of Dispensaries, the sum of, ...		$336,520 00
Total expenditures as in report of December 31, 1911, ...	$96,673 40	
Total expenditures as in report of December 31, 1912, ...	169,194 19	
		265,867 59
Unexpended balance of appropriation, January 1, 1913,		$70,652 41

Item No. 2, for the payment of the cost of diphtheria antitoxin and other Biological Products for free distribution among the poor for the employment of such special and assistant engineers, stream and sanitary inspectors, and such other employees as may be necessary; for the fees and necessary traveling expenses of the County Medical Inspectors and Rural Health Officers; for the necessary traveling expenses of the Commissioner of Health, his assistants and other employees; for the maintenance of the Bureau of Vital and Morbidity Statistics; for the maintenance of laboratories and experimental stations; and for the payment of all other necessary expenses of the Department in supervising epidemics of diseases and in protecting the public health, the sum of,.....		$746,152 00
Total expenditures as in report of December 31, 1911,.....	$196,692 21	
Total expenditures as in report of December 31, 1912,.....	386,620 08	
		583,312 29
Unexpended balance appropriation, January 1, 1913, ...		$162,839 71
Item No. 3, for the acquiring of property; constructing, equipping, and maintaining sanatoria, infirmaries, and dispensaries for the free treatment of indigent persons affected with tuberculosis; and for the maintenance of laboratories for sanitary supervision, isolation, and treatment of indigent persons affected with tuberculosis; and for the preventive education of the public; for the payment of salaries and for all other necessary expenses which may be incurred in this tuberculosis work; the further sum of,		$2,624,808 00
Total expenditures as in report of December 31, 1911, ...	$376,061 15	
Total expenditures as in report of December 31, 1912, ...	1,167,206 00	
		1,543,267 15
Unexpended balance appropriation, January 1, 1913, ...		$1,081,540 85

The receipts and expenditures on account of these appropriations from January 1, 1913, to December 31, 1913, have been as follows:

EMERGENCY FUND, ACT NO. 219.

RECEIPTS.

Received from the Auditor General, May 24, 1913, ...		$24,258 93
		$24,258 93

DISBURSEMENTS.

Expenses Health Officers and County Medical Inspectors on account correspondence, reports, inspecting, quarantining, and disinfecting the following diseases and nuisances:		
Blanket Affidavits, ...	$2 00	
Cerebrospinal Meningitis, ...	30 39	
Chicken Pox, ...	1,441 21	
Diphtheria, ...	2,089 15	
Erysipelas, ...	174 83	
Freight and Drayage, ...	63 53	
Health Officers, ...	440 38	
Measles, ...	14,055 95	
Mumps, ...	817 17	
Nuisance Inspection, ...	241 28	
Office Expense, ...	22	
Pneumonia, ...	70 17	
Scabies, ...	6 95	
Scarlet Fever, ...	1,762 23	
School Inspection, ...	361 11	
Smallpox, ...	344 32	
Tetanus, ...	2 00	
Tonsillitis, ...	2 10	
Tuberculosis, ...	275 21	
Typhoid Fever, ...	1,030 58	
Whooping Cough, ...	1,048 15	
Total expenditures on account of Emergency Fund, January 1,1913, to December 31, 1913, ...		$24,258 93
		$24,258 93

SUMMARY.

Appropriation,		$50,000 00
Total expenditures as in report of December 31, 1906,	$20,191 09	
Total expenditures as in report of December 31, 1907,	5,549 98	
Total expenditures from January 1, 1913, December 31, 1913,	24,258 93	
	$50,000 00	$50,000 00

Note:—The following amounts were received by the Department:

June 26, interest on bank balance,	$1 33	
December 1, interest on bank balance,	17 12	
		$18 45

These were returned to the State Treasurer on the following dates:

July 30,	$1 33
December 1,	17 12
	$18 45

POLK FUND—ACT NO. 355.

And that there were no receipts and expenditures on account of this fund from January 1, 1913, to December 31, 1913, leaving a balance January 1, 1914,	$143 17

SUMMARY.

Appropriation,		$5,000 00
Total expenditures as in report of December 31, 1909,	$3,563 54	
Total expenditures as in report of December 31, 1910,	1,153 33	
Total expenditures as in report of December 31, 1911,	139 96	
		4,856 83
Unexpended balance appropriation January 1, 1914,		$143 17

GENERAL FUND, ACT NO. 864, ITEM NO. 1.

RECEIPTS.

The Auditor General issued warrants on account general salaries, as follows:

January 16,	$833 33	
January 16,	13,188 26	
February 6,	13,188 34	
February 28,	833 33	
March 14,	833 34	
March 24,	13,188 40	
April 7,	13,188 26	
April 17,	833 33	
May 7,	13,188 34	
May 16,	833 31	
		$70,108 24
Total receipts,		$70,108 24

DISBURSEMENTS.

Salaries paid by State Treasurer:

General Office,	$6,608 32	
Division of Accounting and Purchasing,	8,650 00	
Sanitary Engineering Division,	18,208 31	
Morbidity and Marriage Statistics,	2,666 66	
Vital Statistics,	6,766 66	
Division of Dispensaries,	6,133 33	
Medical Division,	7,183 33	
Laboratories and Experimental Stations,	5,525 00	
Division of Distribution of Biological Products,	2,266 68	
Division of Supplies,	1,933 33	
Commissioner's Salary,	4,166 64	
		$70,108 24
Total disbursements,		$70,108 24

SUMMARY.

Appropriation,		$336,520 00
Expenditures from June 1, 1911, to December 31, 1911,	$96,673 40	
Expenditures from January 1, 1912, to December 31, 1912,	169,194 19	
Expenditures from January 1, 1913, to June 1, 1913,	70,108 24	
Unexpended balance lapsing,	544 17	
	$336,520 00	$336,520 00

GENERAL FUND, ACT NO. 864, ITEM NO. 2.

RECEIPTS.

Cash on hand January 1, 1913, as in report of December 31, 1912,	$7,391 25	
Received from the Auditor General warrants on account, as follows:		
January 10,	31,089 66	
January 31,	31,089 66	
March 4,	31,089 66	
March 20,	31,089 66	
April 17,	31,089 82	
		$162,839 71
		$162,839 71

DISBURSEMENTS.

Medical Division.

Expenses Health Officers and County Medical Inspectors on account correspondence, reports, inspecting, quarantining, and disinfecting the following diseases and nuisances:		
Cancer,	$6 00	
Cerebrospinal Meningitis,	58 73	
Chicken Pox,	3,132 89	
Diphtheria,	16,969 37	
Erysipelas,	231 38	
Infantile Paralysis,	43 46	
Malarial Fever,	8 47	
Measles,	15,856 53	
Mumps,	962 07	
Pneumonia,	107 17	
Scabies,	87 34	
Scarlet Fever,	3,546 48	
Smallpox Inspection,	4,705 20	
Syphilis,	15 10	
Tetanus,	2 87	
Tonsillitis,	29 48	
Tuberculosis,	524 83	
Typhoid Fever,	4,637 55	
Whooping Cough,	1,608 51	
		$52,533 43

Miscellaneous Expenditures.

Austin relief work,	$225 85	
Blank affidavits,	7 50	
Commissioner's traveling expenses,	94 64	
Dairy inspection,	16 60	
Disinfectants,	7,196 06	
Educational matter,	233 61	
Establishing local Boards of Health,	7 08	
Freight and drayage,	161 81	
Instructing and appointing Health officers,	1,613 12	
Laboratory,	2,431 25	
Legal services,	1,417 00	
Medical and sanitary school inspection,	38,241 45	
Nuisance inspection,	632 44	
Traveling expenses of the Secretary to Commissioner,	90 76	
		52,369 17

Engineering Division.

Engineers' salaries,	$2,253 75	
Inspectors' salaries,	23,776 25	
Pure water inspection,	13,604 70	
		39,634 70

Vital, Morbidity and Marriage Statistics Division.

Morbidity and marriage statistics,	1,449 40	
Vital statistics,	1,259 91	
		2,709 31

General Expenses.

Clerical salaries,	$7,523 75	
Domestic salaries,	481 00	
Miscellaneous expenses,	148 80	
Office expenses,	1,786 65	
Postage,	5,652 90	
		15,593 10

Total expenditures on account of General Fund, January 1, 1913, to December 31, 1913,	$162,839 71

SUMMARY.

Appropriation,		$746,152 00
Expenditures from June 1, 1911, to December 31, 1911, as in report of December 31, 1911,	$196,692 21	
Expenditures from January 1, 1912, to December 31, 1912, as in report of December 31, 1912,	386,620 08	
Expenditures from January 1, 1913, to December 31, 1913,	162,839 71	
	$746,152 00	$746,152 00

Note:—The following amounts were received by the Department:

January 31, refund Adams Express Co.,	$.30
June 4, interest on bank balance,	227 77
June 23, refund lost package,	20 00
June 23, refund lost box,	2 50
June 24, refund witness fees,	3 00
June 24, refund lost box,	2 50
June 26, refund witness fees,	17 56
June 27, refunded by L. C. Gilette, for 23 tubes vaccine at 15 cents,	3 45
August 7, fees for certified birth and death certificates,	2,671 50
August 20, refund witness fees,	22 28
September 12, refund U. S. Express Co.,	2 50
September 29, refund witness fees,	4 56
November 20, unclaimed checks Austin laborers,	287 90
December 1, interest on bank balance,	6 12
	$3,272 03

These were returned to the State Treasurer on the following dates:

June 7,	$227 77
June 17,	30
June 24,	22 50
June 27,	26 51
August 7,	2,671 50
August 21,	22 28
September 19,	2 50
September 30,	4 56
December 1,	6 12
	$2,984 04
Balance on hand December 31, 1913,	287 99
	$3,272 03

TUBERCULOSIS FUND, ACT NO. 864, ITEM NO. 3.

RECEIPTS.

Cash on hand January 1, 1913, as in report of December 31, 1912,	$97,237 85	
Received from the Auditor General warrants on account as follows:		
January 30,	109,367 00	
February 28,	109,367 00	
March 29,	109,367 00	
May 8,	109,367 00	
May 28,	109,367 00	
June 21,	109,367 00	
August 8,	109,367 00	
December 6,	109,367 00	
		$972,173 85
Received from prothonotary on account, Charles W. Denny contract and now held for directions from court,		8,421 56
Total receipts,		$980,595 41

DISBURSEMENTS.

Dispensaries.

Maintenance:			
Clerical salaries,	$3,241 28		
Disinfectants,	605 46		
Doctors' salaries,	37,211 30		
Drugs,	1,671 92		
Freight and drayage,	962 41		
Janitors' services,	3,997 82		
Milk,	59,980 15		
Nurses' salaries,	41,270 25		
Operating expenses,	5,333 09		
Postage,	1,085 56		
Rent,	10,320 49		
Salad oil,	1,338 89		
Traveling expenses,	8,556 17		
		$175,574 79	
Miscellaneous expenditures:			
Furnishings,	$649 08		
Operating supplies,	464 63		
Traveling Tuberculosis Exhibit,	2,731 99		
		3,845 70	
Total expenditures on account Dispensaries from January 1, 1913, to December 31, 1913,			$179,420 49

Mont Alto Sanatorium.

Maintenance:			
Clerical salaries,	$1,500 00		
Clothing,	10 99		
Coal,	7,053 22		
Disinfectants,	602 25		
Doctors' salaries,	9,058 78		
Drugs, etc.,	1,263 76		
Food stuffs,	54,347 81		
Freight and drayage, etc.,	3,318 16		
Furnishings and supplies,	1,784 22		
Insurance,	2,201 47		
Medical supplies,	588 20		
Milk and eggs,	36,710 16		
Miscellaneous salaries on account maintenance,	37,937 63		
Nurses' salaries,	13,231 65		
Operating expenses,	19,279 27		
Postage,	349 00		
Traveling expenses on account maintenance,	251 70		
Truck patch,	205 39		
		$189,693 66	
Plant expenditures:			
Ambulance,	$275 00		
Automobile,	640 90		
Building supplies, etc.,	1,313 25		
Garage,	528 49		

Laundry machinery,	549 63	
Miscellaneous salaries on account construction,	2,080 18	
New roads, sidewalks, etc.,	3,297 74	
Building repairs,	116 65	
Poultry houses,	14 86	
Shrubs, flowers, etc.,	71 09	
Sewage disposal plant,	252 40	
Traveling expenses on account construction,	59 77	
Water system,	19 12	
Water tank,	1,924 87	
		11,143 95

Total expenditures on account, Mont Alto Sanatorium from January 1, 1913, to December 31, 1913, ... $200,837 61

Cresson Sanatorium.

Maintenance:

Clerical salaries,	$540 00	
Clothing,	1,207 50	
Coal,	2,772 02	
Disinfectants,	182 56	
Doctors' salaries,	2,387 24	
Drugs,	827 10	
Food stuffs,	12,207 12	
Insurance,	3,140 00	
Medical supplies,	997 72	
Milk and eggs,	5,388 18	
Miscellaneous salaries on account maintenance,	13,708 69	
Miscellaneous supplies,	3,842 37	
Nurses' salaries,	2,227 21	
Operating expenses,	10,151 77	
Postage, etc.,	416 30	
Poultry farm,	348 86	
Traveling expenses on account maintenance,	551 74	
Truck patch,	258 46	
		$61,154 84

Plant expenditures:

Alterations to Jones Cottage,	$40 87	
Building supplies,	651 63	
Electric feeder lines, etc.,	13,966 00	
Electric light fixtures,	3,621 09	
Freight and drayage, etc., on account construction,	1,845 00	
Furnishings and supplies,	21,351 36	
Foundation for scale,	71 41	
Kitchen and bakery equipment,	670 93	
Laundry machinery,	10,757 75	
Miscellaneous expenses on account construction,	156 86	
Miscellaneous salaries on account construction,	5,424 08	
New road, sidewalks, etc.,	4,038 31	
Heating plant,	33,947 59	
On account cottages, pavilions, etc.,	19,328 17	
On account East Ward, etc., buildings,	1,305 94	
On account refrigeration plant,	1,161 21	
On account sewage disposal plant,	2,548 98	
Power equipment,	4,347 60	
Temporary morgue,	339 08	
Traveling expenses on account construction,	956 45	
Trees, shrubs, etc.,	74 17	
Water supply,	13,688 57	
Water tanks,	2,637 44	
		112,930 49

Total expenditures on account Cresson Sanatorium from January 1, 1913, to December 31, 1913, ... $204,085 33

Hamburg Sanatorium.

Expenditures on account construction:

Advertising,	$75 69
Alterations—barns, buildings, etc.,	92 56
Building supplies,	1,115 11
Farm,	2,498 54

Freight and drayage,	50 28		
Horses and mules,	500 00		
Miscellaneous expenses on account construction,	595 86		
Miscellaneous salaries on account construction,	1,582 63		
Miscellaneous supplies on account construction,	303 33		
Dining and administration building, east and west wards, connecting corridors, etc.,	282,420 43		
Spring house,	108 25		
Total expenditures on account Hamburg Sanatorium from January 1, 1913, to December 31, 1913,			289,340 68
Total expenditures on account Tuberculosis Fund, from January 1, 1913, to December 31, 1913,			$873,684 11
Refunded to State Treasurer October 24, to correct error on voucher A-44272,			1 00
*Balance held in trust on account, Charles W. Denny contract,		$8,421 56	
Cash on hand January 1, 1914,		98,488 74	
Total cash on hand January 1, 1914,			$106,910 30
			$980,595 41

*Note—Claims against this amount were filed with the Department by creditors of Charles W. Denny, and in consequence the amount was paid by this Department to the prothonotary November 15, 1912. After legal proceedings the Franklin County Court directed the prothonotary to return the money to us. This was done January 25, 1913. The case is now before the Supreme Court and the money is held in trust by this Department awaiting its decision.

SUMMARY.

Appropriation,			$2,624,808 00
Expenditures from June 1, 1911, to December 31,1911, as in report of December 31, 1911, ..	$376,061 15		
Expenditures from January 1, 1912, to December 31, 1912, as in report of December 31, 1912,	1,167,206 00		
Expenditures from January 1, 1913, to December 31, 1913,	873,685 11		
		$2,416,952 26	
Held in trust on account Charles W. Denny contract, ..		8,421 56	
			2,408,530 70
Unexpended balance January 1, 1914,			$216,277 30

Note:—The following amounts were received by the Department:

June 23, interest on bank balance,	$1,018 45
June 24, refund on thermometers,	3 00
July 23, refund sale of scrap iron,	1 55
December 17, interest on bank balance,	826 07
	$1,849 07

These were returned to the State Treasurer on the following dates:

June 24,	$1,018 45
June 28,	3 00
August 19,	1 55
December 18,	826 07
	$1,849 07

The Commissioner further begs leave to report that the Legislature of 1913 appropriated the following sums for the use of the several divisions of the Department, for the term of two years from June 1, 1913, to May 31, 1915.

APPROPRIATIONS.

ACT NO. 407, SESSION—1913.

Item No. 1, for the payment of salaries of the General Office, Medical Division, Laboratories and Experimental Stations, Division Distribution of Biological Products, Bureau of Vital Statistics, Morbidity and Marriage Statistics, Sanitary Engineering Division, Division of Accounting and Purchasing, Division of Supplies and Division of Dispensaries, the sum of,	$104,217 50
Item No. 2,—for the payment of the cost of diphtheria antitoxin and other products for free distribution for the poor; for the employment of such special and assistant engineers, stream and sanitary inspectors, and such other employees as may be necessary; for the fees and necessary traveling expenses of the County Medical Inspectors and Rural Health Officers; for the necessary traveling expenses of the Commissioner of Health, his assistants and other employees; for the maintenance of the Bureau of Vital and Morbidity Statistics; for the maintenance of Laboratories and Experimental Stations; and for the payment of all other necessary expenses of the Department of Health in supervising epidemics of diseases and in protecting the public health, the sum of,	$950,000 00
Item No. 3,—for the construction, equipping and maintaining sanatoria, infirmaries, and dispensaries for the free treatment of indigent persons affected with tuberculosis; and for the maintenance of laboratories for sanitary supervision, isolation, and treatment of indigent persons affected with tuberculosis; and for the preventive education of the public; for the payment of salaries and for all other necessary expenses which may be incurred in this tuberculosis work the further sum of,	$2,625,000 00
Item No. 4,—for the medical inspection of the pupils of the public schools, in accordance with the provisions of the school code, the sum of,	$200,000 00

The receipts and expenditures on account of these appropriations from June 1, 1913, to December 31, 1913, have been as follows:

GENERAL FUND, ACT NO. 407, ITEM NO. 1.

RECEIPTS.

The Auditor General issued warrants on account General salaries as follows:		
August 1,	$1,666 67	
August 1,	15,970 16	
August 1,	15,832 37	
August 28,	16,011 55	
September 5,	833 34	
September 26,	833 34	
September 26,	16,011 82	
October 27,	15,987 55	
October 27,	833 33	
November 22,	15,851 63	
November 26,	833 33	
December 19,	16,001 82	
December 19,	833 34	
		$117,500 25
		$117,500 25

DISBURSEMENTS.

Salaries paid by State Treasurer:		
General office,	$8,966 66	
Division of Accounting and Purchasing,	13,731 68	

Division of Sanitary Engineering,	33,600 06	
Morbidity and Marriage Statistics,	3,863 34	
Bureau of Vital Statistics,	11,719 16	
Division of Dispensaries,	10,109 16	
Medical Division,	14,268 34	
Laboratories and Experimental Stations,	8,146 00	
Division of Distribution of Biological Products,	3,710 00	
Division of Supplies,	3,552 50	
Commissioner's salary,	5,833 35	
		$117,500 25
		$117,500 25

SUMMARY.

Appropriation,	$404,217 50
Expenditures from June 1, 1913, to December 31, 1913,	117,500 25
Unexpended balance appropriation, January 1, 1914,	$286,717 25

GENERAL FUND, ACT NO. 407, ITEM NO. 2.

RECEIPTS.

The Auditor General issued warrants on account as follows:

August 1,	$39,583 33	
August 1,	39,583 33	
August 15,	39,583 33	
September 13,	39,583 33	
October 8,	39,583 33	
November 8,	39,583 33	
December 6,	39,583 33	
		$277,083 31
		$277,083 31

DISBURSEMENTS.

Medical Division.

Expenses Health Officers and County Medical Inspectors on account correspondence, reports, inspecting, quarantining, and disinfecting the following diseases and nuisances:

Cancer,	$8 95	
Cerebrospinal Meningitis,	178 22	
Chicken Pox,	4,117 71	
Cholera,	3 50	
Diphtheria,	40,446 35	
Dysentery,	64 00	
Erysipelas,	607 05	
Infantile Paralysis,	108 09	
Malarial Fever,	58 55	
Measles,	49,605 53	
Mumps,	3,654 60	
Pneumonia,	316 64	
Scabies,	187 51	
Scarlet Fever,	9,110 18	
Smallpox,	13,489 67	
Syphilis,	18 38	
Tetanus,	370 52	
Tonsillitis,	19 03	
Tuberculosis,	1,687 93	
Typhoid Fever,	14,497 61	
Whooping Cough,	6,834 02	
		$145,384 04

Miscellaneous Expenditures.

Baby saving show,	$299 46
Blanket affidavits,	15 00
Commissioner's traveling expenses,	106 17
County Medical Inspectors,	3,834 56
Disinfectants,	7,812 15
Educational matter,	153 92
Freight and drayage,	1,718 64
Health officers,	1,464 23

Laboratory,	4,767 56	
Legal services,	2,062 44	
Medical and sanitary school inspection,	376 07	
Nuisance inspection,	3,701 17	
Traveling expenses of the Commissioner's Secretary,	29 07	
		26,340 44

Engineering Division:

Engineers' salaries,	$1,543 75	
Inspectors' salaries,	31,129 17	
Pure water inspection,	37,235 24	
		69,908 16

Division of Vital Statistics.

Morbidity and marriage statistics,	$1,416 92	
Vital statistics,	1,476 62	
		2,893 54

General Expenses:

Clerical salaries,	$10,132 88	
Domestic salaries,	611 00	
General expenses,	147 31	
Office expenses,	1,974 40	
Postage,	8,647 80	
		21,543 39

Total expenditures on account of General Fund from June 1, 1913, to December 31, 1913,	$266,009 57
Cash on hand January 1, 1914,	11,013 74
	$277,083 31

SUMMARY.

Appropriation,	$950,000 00
Expenditures from June 1, 1913, to December 31, 1913,	266,069 57
Unexpended balance appropriation January 1, 1914,	$683,930 43

Note:—The following amounts were received by the Department:

September 30, costs collected in suits,	$10 40
October 15, costs collected in suits,	7 52
October 15, costs collected in suits,	29 60
December 1, costs collected in suits,	12 85
December 1, interest on bank balance,	220 21
December 8, costs collected in suits,	189 69
December 8, costs collected in suits,	5 40
December 13, costs collected in sunits,	17 30
	$492 97

These were returned to the State Treasurer on the following dates:

October 4,	$10 40
November 3,	37 12
December 1,	220 21
December 18,	12 85
December 18,	17 30
December 18,	189 69
December 18,	5 40
	$492 97

TUBERCULOSIS FUND. ACT NO. 407. ITEM NO. 3.

RECEIPTS.

Received from the Auditor General warrants on account, as follows:		
August 1,	$100,375 00	
August 27,	100,375 00	
September 24,	100,375 00	
October 28,	100,375 00	
December 6,	100,375 00	
		$546,875 00
Total receipts,		$546,875 00

DISBURSEMENTS.

Dispensaries.

Maintenance:

Clerical salaries,	$3,088 53	
Disinfectants,	466 88	
Doctors' salaries,	33,658 91	
Drugs,	1,462 91	
Freight and drayage,	98 38	
Janitor's services,	3,835 07	
Medical supplies,	101 90	
Milk,	39,920 55	
Nurses, salaries,	42,431 29	
Operating expenses,	5,573 53	
Postage,	289 02	
Rent,	14,043 49	
Salad oil,	736 63	
Traveling expenses,	7,677 33	
		$153,384 42

Miscellaneous Expenditures:

Furnishings,	$3,175 79	
Operating supplies,	576 14	
Traveling Tuberculosis Exhibit,	3,000 15	
		6,752 08

Total expenditures on account Dispensaries from June 1, 1913, to December 31, 1913,	$160,136 50

Mont Alto Sanatorium.

Maintenance:

Blacksmith shop,	$132 49	
Clerical salaries,	1 048 00	
Coal,	14,840 99	
Disinfectants,	684 90	
Doctors' salaries,	9,542 19	
Drugs,	977 29	
Food stuffs,	54,923 36	
Freight and drayage, etc.,	2,622 15	
Furnishing and supplies,	4,287 32	
Insurance,	5,723 11	
Medical supplies,	394 75	
Milk and eggs,	34,563 59	
Miscellaneous salaries on account maintenance,	36,754 86	
Nurses' salaries,	13,371 57	
Operating expenses,	15,389 97	
Operating supplies,	1,060 89	
Postage, etc.,	249 48	
Poultry farm,	802 96	
Traveling expenses on account maintenance,	260 09	
		$197,629 96

Plant Expenditures:

Building supplies,	$525 65	
Central heating plant,	231 56	
Garage,	63 00	
Miscellaneous salaries on account construction,	2,241 10	
New Laboratory,	50 24	
Poultry houses,	36 75	
Repairs to buildings,	149 43	
Roads and grading,	5,820 67	
Sewage disposal plant,	185 77	
Shrubs, flowers, etc.,	26 89	
Traveling expenses on account construction,	9 95	
Water supply,	989 06	
		10,330 07

Total expenditures on account Mont Alto Sanatorium from June 1, 1913, to December 31, 1913,	207,960 03

Cresson Sanatorium.

Maintenance:

Blacksmith shop,	$102 99
Clerical salaries,	739 50
Coal,	2,529 26

Disinfectants,	179 12	
Doctors' salaries,	2,516 85	
Drugs,	122 74	
Food stuffs,	19,841 83	
Freight and drayage,	723 75	
Insurance,	876 00	
Medical supplies,	357 72	
Milk and eggs,	13,386 49	
Miscellaneous salaries on account maintenance,	21,763 38	
Miscellaneous supplies,	2,609 21	
Motor truck and automobile expense,	2,941 42	
Nurses' salaries,	3,793 31	
Operating expenses,	4,249 98	
Operating supplies,	635 32	
Postage, etc.,	187 47	
Poultry farm,	979 52	
Traveling expenses on account maintenance,..	228 53	
		78,794 39
Plant Expenditures:		
Alterations—Jones cottage,	$345 56	
Building roads, fences, grading, etc.,	6,677 86	
Building supplies,	134 46	
Central heating plant,	1,620 63	
Cottages, pavilions, etc.,	101 29	
East ward, etc., buildings,	3,301 41	
Electric feeder lines, etc.,	168 96	
Freight and drayage on account construction,	173 54	
Furnishings and supplies,	15,619 95	
Gate-keeper house, scale and hose houses,....	350 36	
Miscellaneous salaries on account construction,	6,007 21	
On account kitchen and bakery equipment,....	647 83	
On account power equipment,	9,351 59	
Poultry houses,	713 55	
Refrigerating and ice making plant,	1,103 50	
Sewage disposal plant,	1,373 05	
Shrubs, flowers, etc.,	122 91	
Superintendent's salary, State Board of Grounds and Buildings,	30 00	
Traveling expenses on account construction,...	156 15	
Underground electric conduit, etc.,	3,258 90	
Vegetable cellar,	907 44	
Water supply, etc.,	5,524 44	
		57,690 59
Total expenditures on account Cresson Sanatorium from June 1, 1913, to December 31, 1913,		136,484 98

Hamburg Sanatorium.

Expenditures on account Construction:		
Advertising,	$41 13	
Alterations—barns, farm buildings, etc.,	1,497 27	
Building supplies,	13 50	
Central heating plant,	2,541 30	
Dining and administration building expense,..	2,666 48	
Farm,	2,417 35	
Freight and drayage,	40 91	
Horses and mules,	500 00	
Power equipment,	6 20	
Roads, sidewalks, grading, etc.,	76 49	
Superintendent's salary, State Board of Grounds and Buildings,	750 00	
Traveling expenses on account construction,	414 23	
Water supply,	116 94	
Total expenditures on account Hamburg Sanatorium from June 1, 1913, to December 31, 1913,		11,000 80
Total expenditures on account tuberculosis fund from June 1, 1913, to December 31, 1913,		515,672 31
Cash on hand January 1, 1914,		31,202 69
		546,875 00

SUMMARY.

Appropriation,	$2,625,000 00
Expenditures from June 1, 1913, to December 31, 1913,	515,672 31
Unexpended balance appropriation January 1, 1914,	$2,109,327 69

Note:

The following amounts were received by the Department:

December 27, interest on bank balance,	$615 32
December 23, refunded by U. S. Fidelity and Guarantee Co. on bond covering contract dated May 11, 1910, S. A. Louder,	500 00
	$1,115 32

These were returned to the State Treasurer on the following dates:

December 18,	$615 32
December 24,	500 00
	$1,115 32

SCHOOL MEDICAL INSPECTION FUND, ACT NO. 407, ITEM NO. 4.

RECEIPTS.

The Auditor General issued warrants on account as follows:		
August 1,	$8,333 33	
September 13,	8,333 33	
October 3,	8,333 33	
October 6,	8,333 33	
November 26,	8,333 33	
November 26,	8,333 33	
		$49,999 98
Total receipts,		$49,999 98

DISBURSEMENTS.

Miscellaneous Expenses:		
Doctors' fees for inspection,	$34,406 51	
Freight and drayage,	3 51	
Office expense,	21 60	
Postage,	6,340 00	
Supplies,	473 29	
Traveling expenses,	17 17	
Total expenditures on account school medical inspection fund from June 1, 1913, to December 31, 1913,		$41,262 08
Cash on hand January 1, 1914,		8,737 90
		$49,999 98

SUMMARY.

Appropriation,	$200,000 00
Expenditures from June 1, 1913, to December 31, 1913,	41,262 08
Unexpended balance appropriation January 1, 1914,	$158,737 92

Note:

The following amount was received by the Department:

December 1, interest on bank balance,	$49 65

This was returned to the State Treasurer on the following date:

December 3,	$49 65

GETTYSBURG FUND.

The Commissioner further begs leave to report that the Fiftieth Anniversary of the Battle of Gettysburg Commission set aside the sum of twenty-five thousand dollars for the use of the Department of Health in establishing and maintaining an emergency hospital camp together with medical and surgical relief stations and adequate public comfort stations, and in establishing and maintaining a pure water supply for the general public during the celebration of the Fiftieth Anniversary of the Battle of Gettysburg.

The receipts from this fund and the expenditures on account of the celebration were as follows:—

RECEIPTS.

May 22,	$150 00	
June 17,	5,000 00	
July 7,	10,000 00	
September 24,	50 00	
September 29,	5,000 00	
November 21,	4,000 00	
		$24,200 00
		$24,200 00

DISBURSEMENTS.

Miscellaneous expenses:		
Ambulances, express, freight and drayage, teams, etc.,		$149 74

Note:

Three ambulances were in services, one with a team of mules was loaned by the State Sanatorium for Tuberculosis at Mont Alto, and one horse ambulance, and one automobile ambulance with a chauffeur were loaned by the Medico-Chirurgical Hospital of Philadelphia.

Construction:		
Water works and sewage system, including maintenance, for general supply of Gettysburg above normal systems and also for the emergency hospitals, comfort houses, big tent, etc.,	$4,571 07	
Comfort stations,	7,160 03	
Express, freight and drayage,	241 62	
Board, lodging and traveling expenses,	786 87	
Electrical work,	153 74	
General camp construction,	952 21	
Automobile and livery hire during time of construction and evacuation,	387 70	
Advertising for bids,	30 98	
		$14,284 22
Water Inspection:		
Board, lodging, and traveling expenses,	$342 46	
Automobile and livery hire,	28 00	
		370 46
Hospital trains,		150 00
Medical supplies and equipment,		796 25
Furnishings,		1,914 97

Note: This item includes all cots, bedding, linen, blankets, dishes, cutlery, kitchen utensils, wash stands, tables, chairs, stoves, lanterns, etc., etc.

General Operating Supplies:		
Uniforms,	$192 21	
Disinfectants,	87 28	
Freight, express, and drayage,	126 39	
Food stuffs,	672 87	
Ice,	270 00	
Miscellaneous supplies,	161 33	
		1,510 08
General Operating Expenses:		
Attendants at comfort stations,	$387 87	
Orderlies,	384 26	
Cooks,	250 86	
Superintendents,	223 78	
Automobile and livery hire,	229 91	
Telegraph and telephone,	195 42	
Printing,	63 25	
Traveling expenses,	87 40	
		1,822 75
Medical Service:		
Salaries and traveling expenses of medical staff,	$1,009 73	
Salaries and traveling expenses of nursing staff,	212 89	
Board and lodging,	57 24	
		1,279 86
Total disbursements,		$22,278 33
December 31, 1913.—Unexpended balance returned to the Treasurer of Fiftieth Anniversary of the Battle of Gettysburg Commission,		1,921 67
		$24,200 00

Note: The following amount was received by the Department:

December 30, interest on bank balance,	$1 83

This was returned to the Treasurer of Fiftieth Anniversary of the Battle of Gettysburg Commission, on the following date:

December 30,	1 83

DIVISION OF SUPPLIES.

CHARLES HARTZELL, *Superintendent.*

DIVISION OF SUPPLIES.

During the year 1913 shipments, by express and freight, as usual, were heavier than in previous years, which will be seen by the comparative table of shipments below:

1907—July to December,	832
1908—January to June,	1824
1908—July to December,	2512
1909—January to June,	3376
1909—July to December,	3880
1910—January to June,	4313
1910—July to December,	2962
1911—January to June,	4904
1911—July to December,	3479
1912—January to June,	4275
1912—July to December,	4441
1913—January to June,	4331
1913—July to December,	4681

The Division of Supplies makes requisitions for, receives and receipts for, all furniture, type-writers, stationery, and printed matter, such as cards, circulars, pamphlets, and reports; and furnishes different articles, upon requisition, to the seven hundred (700) Department Health Officers in charge of second-class townships throughout the State, the sixty-six (66) County Medical Inspectors, one hundred and fifteen (115) Tuberculosis Dispensaries, the Sanatoria at Mont Alto and Cresson, as well as the various Divisions of the Department.

Account is kept of all goods required from time to time, and of the stock on hand.

This Division also receives and receipts for all express and freight matter, delivers the same to the several Divisions, also receives and answers all inquiries pertaining to supplies.

The counting, assorting, packing, and shipping of printed matter and other goods entails considerable labor, but all supplies are so arranged as to be shipped or mailed without a moment's delay.

During the past year one thousand, eight hundred and fifty one (1,851) units of disinfectants were shipped to County Medical Inspectors, Health Officers, and Dispensaries (5 gals. formaldehyde, 22 lbs.

potassium permanganate and 5 rolls of gummed paper, composing a unit), an increase of six hundred and seventy-two (672) units over shipments of 1912.

Laboratory Outfits, Nos. 1, 2, 3 and 4, are assembled and forwarded, upon request, to eight thousand (8,000) physicians in Pennsylvania (exclusive of Philadelphia and Pittsburgh) for sending specimens to the Department's Laboratories for free pathological and bacteriological examination.

Schedules, catalogues, and mailing lists are made up and corrected daily, so that all publications of the Department may be forwarded promptly as issued to those interested in the work of the Department. Numerous communications are received from physicians and colleges in other States and foreign countries requesting that their names be placed on the mailing list to receive all publications; consequently, the mailing lists are growing very rapidly.

Ten thousand (10,000) copies of the Pennsylvania Health Bulletin are mailed monthly, and two thousand (2,000) copies of the Department's Report are forwarded annually, to colleges, sanatoria, libraries, physicians, civil engineers, and many interested persons and officials of note.

This Division now occupies two capacious rooms, but the amount of storage space necessary to carry the required stock far exceeds the present quarters. Within the coming year another room is to be provided, which will greatly facilitate the storing and handling of the prodigious amount of goods required by the Department.

INDEX.

NOTE.—Important errata are listed below.

Errata are numerous. The following may be noted:--

P. 53, line 11. Let it read, Dr. John Mackrell.
P. 80. To the clerks of the Division of Accounting, etc. add: Miss Katharine L. Hood, Duncannon.
P. 145, line 20 from below, Let it read: W. G. Turnbull.
P. 146, line 1. Let it read: George B. Kunkel.
line 14. Let it read: J. Moore Campbell.
P. 195, line 12. Make it read: enteritidis.
P. 273, In Bedford County, read: Woodbury.
P. 274. In Bucks County read: W. Rockhill, and in Butler: Zelienople.
P. 275. In Crawford County read Amity, for Amith, and in Erie W. Mead, for W. Mean.
P. 276. In Lancaster County make it Pequea, and in Lawrence, Ellwood.
P. 278. In Snyder County let it read: Middleburg.
P. 294, line 15. It should read: "verdict *** was obtained."
P. 322, line 1. Make it: Clearfield, and in line 12, read Pike Township, and in line 18, Beccaria.
P. 331, line 12 from below. The C. M. I. is Dr. H. M. Hiller.
P. 411, line 20. Let it read: Conewango.
P. 450, No. 30. It should read: Tuberculosis meningitis.
P. 553, line 10 of the table. For Impetigo contagiosa, read: Epidemic dysentery, and in line 14 let it read: contagiosa.
P. 556. In the table let it read: Trichiniasis.
P. 578. For Allegheny, read: Pittsburgh, North Side.
P. 579. In Chester County, make it: Tredyffrin Township.
P. 581. In York County, let it read: Shrewsbury.
P. 680, line 6 from below. Let it read: Summit Water Supply Company.
P. 745. Dispensary No. 98 is South Bethlehem.
P. 771. line 2. Let it read: Port Allegany.
P. 784, No. 85. Let it read: Riverton.
P. 808, No. 66. Add: "also supplies Cumberland Md."
P. 877. Under Harrisburg, read: Suburban Drainage Co., *not* Susquehanna.
P. 886, No. 260. For Clearfield read Elk.
P. 890, No. 82. Let it read: Third Ward Sewer Company.
P. 964, No. 19. Connellsville is a city and in Fayette County.
P. 966, No. 51. Let it read: Summit Water Supply Company.
P. 967, No. 63. Let it read: Sandy Lick.
P. 969, 969, No. 87. The title is: Jackson Water Company.
No. 92. Windber is in Somerset County.
No. 3. "Berwindino" village is in Paint Township.
No. 2. Let it read: Summit Water Supply Company.
P. 970, No. 23. Let it read: East Wheatfield and Buffington Water Companies.
P. 972, line 24 from below: Let it read: Pennsylvania Training School.
P. 973 line 1. Change Cambria to Somerset.
P. 996, line 26 from below. Let it read: Public.
P. 1048, line 10 from below. Let it read: Wissinoming.